



Contract Review Sheet

PW-5197-23

Contract for Services #: **PW-5197-23** Amendment #: _____

Contact: **Chalyce MacDonald** Department: **Public Works Department**

Phone #: **(503) 566-4139** Date Sent: **Thursday, January 12, 2023**

Title: **Noxious Weed Mitigation and Native Plant Restoration**

Contractor's Name: **Ash Creek Forest Management LLC**

Term - Date From: **Execution** Expires: **January 31, 2026**

Original Contract Amount: \$ **790,000.00** Previous Amendments Amount: \$ **-**

Current Amendment: \$ **-** New Contract Total: \$ **790,000.00** Amd% **0%**

☐ Incoming Funds ☐ Federal Funds ☐ Reinstatement ☐ Retroactive ☐ Amendment greater than 25%

Source Selection Method: **20-0260 Request for Proposal** RFP# **1171**

Description of Services or Grant Award

Service contract to restore County parkland and right-of-way acreage affected by the Beachie Creek wildfire in Santiam Canyon. Vegetation and forest management services will include manual and mechanical site prep, seeding, planting, survey and monitoring, aquatic site prep, project management, use of herbicide, etc.

\$639,482 will be paid for through an Oregon Watershed Enhancement Board (OWEB) grant. The remaining \$150,518 will be paid from the Capital Projects budget for mitigation sites over the term of the agreement.

Desired BOC Session Date: **1/25/2023** BOC Planning Date: **1/12/2023**

Files submitted in CMS: **1/4/2023** Printed packet & copies due in Finance: **1/10/2023**

BOC Session Presenter(s) **Thomas Kissinger**

FOR FINANCE USE

Date Finance Received: _____ Date Legal Received: _____

Comments: **Y**

REQUIRED APPROVALS

DocuSigned by:

DS
JW

1/13/2023

Finance - Contracts

Date

Grant Review

Contract Specialist

Legal Counsel

Date

Chief Administrative Officer

Date



MARION COUNTY BOARD OF COMMISSIONERS

Board Session Agenda Review Form

Meeting date: January 25, 2023

Department: Public Works

Agenda Planning Date: 1/12/23 (n/a)

Time required: 10 min

☐ Audio/Visual aids n/a

Contact: Thomas Kissinger

Phone: 503-566-4158

Department Head Signature:

DocuSigned by:

Brian Melulas

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TITLE

Consider approval of contract PW-5197-23 with Ash Creek Forest Management LLC (ACFM) for Noxious Weed Mitigation and Native Plant Restoration in the amount of \$790,000.

Issue, Description & Background

Marion County Public Works manages 250.69 acres of parkland over seven different parks and 137.23 acres of right-of-way, which has been affected by the 2020 Beachie Creek wildfire in the Santiam Canyon. Marion County, along with various Federal, State, and local partners has completed hazard tree mitigation work and is preparing long-term plans for restoration throughout these public lands. The County requires services for the restoration process on these lands through targeted native plant restoration and noxious weed mitigation. Additionally, Marion County Public Works manages 7.5 acres of Federal and State permitted County Project Mitigation areas currently spread over eight sites throughout the county that require vegetation management and noxious weed mitigation services.

Financial Impacts:

\$639,482.00 of this contract will be paid for through an Oregon Watershed Enhancement Board grant. The remaining contract value (estimated \$150,518.00) will be paid from the Capital Projects budget for mitigation sites over the term of the agreement.

Impacts to Department & External Agencies

Entering into this agreement may involve various departments in Public Works, including Environmental Services, Parks, and Stormwater. The project will benefit the public at large by restoring public parks and protecting native vegetation. The project is an approved CIP in the current budget year.

Options for Consideration:

- 1) Approve the contract for \$790,000.00 with ACFM
- 2) Take no action at this time

Recommendation:

Public Works Department recommends the Board choose option 1 to approve the contract with ACFM

List of attachments:

Contract for Services, ACFM Rates, Planting Method

Presenter:

Thomas Kissinger

Copies of completed paperwork sent to the following: (Include names and e-mail addresses.)

Copies to:

Chalyce MacDonald, cmacdonald@co.marion.or.us

**MARION COUNTY
CONTRACT FOR SERVICES
PW-5197-23**

This contract is between Marion County (a political subdivision of the State of Oregon) hereinafter called County, and Ash Creek Forest Management LLC, an Oregon Corporation hereinafter called Contractor.

Contractor agrees to perform, and County agrees to pay for, the services and deliverables described in Exhibit A (the “Work”).

1. TERM

This Contract is effective on the date it has been signed by all parties and all required County approvals have been obtained. This Contract expires on **January 31, 2026**. The parties may extend the term of this Contract provided that the total Contract term does not extend beyond January 31, 2028.

2. CONSIDERATION

- A. The maximum, not-to-exceed compensation payable to Contractor under this Contract, which includes any allowable expenses, is \$790,000.00. County will not pay Contractor any amount in excess of the not-to-exceed compensation of this Contract for completing the Work and will not pay for Work performed before the date this Contract becomes effective or after the termination of this Contract. If the maximum compensation is increased by amendment of this Contract, the amendment must be fully effective before Contractor performs Work subject to the amendment.
- B. Interim payments to Contractor shall be made in accordance with the payment schedule and requirements in Exhibit A.
- C. If specified below, county’s payments to Contractor under this agreement will be paid in whole or in part with federal funds. If so specified, by signing this agreement, Contractor certifies neither it nor its employees, contractors, subcontractors or subgrantees who will perform the Project activities are currently employed by an agency or department of the federal government. If applicable, Contractor shall comply with Exhibit B: Appendix II To Part 200—Contract Provisions For Non-Federal Entity Contracts Under Federal Awards

In accordance with 2 CFR 200.331, Contractor has been designated:

- ☐ Subrecipient
- ☐ Contractor/Vendor
- ☒ Not applicable – (there are no federal funds tied to the contract)

3. COMPLIANCE WITH STATUTES AND RULES

- A. County and the Contractor agree to comply with the provisions of this contract, its exhibits and attachments and all applicable federal, state, and local statutes and rules.

Unless otherwise specified, responsibility for all taxes, assessment, and any other charges imposed by law upon employers shall be the sole responsibility of the Contractor. Failure of the Contractor or the County to comply with the provisions of this contract and all applicable federal, state, and local statutes and rules shall be cause for termination of this contract as specified in sections concerning recovery of funds and termination.

County's performance under this Contract is conditioned upon Contractor's compliance with the obligations intended for contractors under ORS 279B.220, 279B.225 (if applicable to this Contract), 279B.230, 279B.235 (if applicable to this Contract) and ORS 652, which are incorporated by reference herein.

- B. Contractor must, throughout the duration of this Contract and any extensions, comply with all tax laws of this state and all applicable tax laws of any political subdivision of this state. For the purposes of this Section, "tax laws" includes all the provisions described in subsection 27. C. (i) through (iv) of this Contract.

Any violation of subsection B of this section shall constitute a material breach of this Contract. Further, any violation of Contractor's warranty, in subsection 27.3 of this Contract, that Contractor has complied with the tax laws of this state and the applicable tax laws of any political subdivision of this state also shall constitute a material breach of this Contract. Any violation shall entitle the County to terminate this Contract, to pursue and recover any and all damages that arise from the breach and the termination of this Contract, and to pursue any or all of the remedies available under this Contract, at law, or in equity, including but not limited to:

- i. Termination of this Contract, in whole or in part;
 - ii. Exercise of the right of setoff, and withholding of amounts otherwise due and owing to Contractor, in an amount equal to State's setoff right, without penalty; and
 - iii. Initiation of an action or proceeding for damages, specific performance, declaratory or injunctive relief. The County shall be entitled to recover any and all damages suffered as the result of Contractor's breach of this Contract, including but not limited to direct, indirect, incidental and consequential damages, costs of cure, and costs incurred in securing replacement Services.
- C. These remedies are cumulative to the extent the remedies are not inconsistent, and the County may pursue any remedy or remedies singly, collectively, successively, or in any order whatsoever.

4. CIVIL RIGHTS, REHABILITATION ACT, AMERICANS WITH DISABILITIES ACT AND TITLE VI OF THE CIVIL RIGHTS ACT

Contractor agrees to comply with the Civil Rights Act of 1964, and 1991, Americans with Disabilities Act of 1990, and Section 504 of the Rehabilitation Act of 1973, and Title VI as implemented by 45 CFR 80 and 84 which states in part, No qualified person shall on the basis of disability, race, color, or national origin be excluded from participation in, be denied the benefits of, or otherwise be subjected to discrimination under any program or activity which received or benefits from federal financial assistance.

5. TIME IS OF THE ESSENCE

Contractor agrees that time is of the essence in the performance of this Contract.

6. FORCE MAJEURE

Neither County nor Contractor shall be responsible for any failure to perform or for any delay in the performance of any obligation under this Contract caused by fire, riot, acts of God, terrorism, war, or any other cause which is beyond the breaching party's reasonable control. Contractor shall, however, make all reasonable efforts to remove or eliminate the cause of Contractor's delay or breach and shall, upon the cessation of the cause, continue performing under this Contract. County may terminate this Contract

upon written notice to Contractor after reasonably determining that the delay or breach will likely prevent successful performance of this Contract.

7. FUNDING MODIFICATION

- A. County may reduce or terminate this contract when state or federal funds are reduced or eliminated by providing written notice to the respective parties.
- B. In the event the Board of Commissioners of the County reduces, changes, eliminates, or otherwise modifies the funding for any of the services identified, the Contractor agrees to abide by any such decision including termination of service.

8. RECOVERY OF FUNDS

Expenditures of the Contractor may be charged to this contract only if they (1) are in payment of services performed under this contract, (2) conform to applicable state and federal regulations and statutes, and (3) are in payment of an obligation incurred during the contract period.

Any County funds spent for purposes not authorized by this contract and payments by the County in excess of authorized expenditures shall be deducted from future payments or refunded to the County no later than thirty (30) days after notice of unauthorized expenditure or notice of excess payment.

Contractor shall be responsible to repay for prior contract period excess payments and un-recovered advanced payments provided by the County. Repayment of prior period obligations shall be made to the County in a manner agreed on.

9. ACCESS TO RECORDS

- A. Contractor shall permit authorized representatives of the County, State of Oregon, or the applicable audit agencies of the U.S. Government to review the records of the Contractor as they relate to the contract services in order to satisfy audit or program evaluation purposes deemed necessary by the County and permitted by law.
- B. Contractor agrees to establish and maintain financial records, which indicate the number of hours of work provided, and other appropriate records pertinent to this contract shall be retained for a minimum of three (3) years after the end of the contract period. If there are unresolved audit questions at the end of the three-year period, the records must be maintained until the questions are resolved.

10. REPORTING REQUIREMENTS

Contractor shall provide County with periodic reports at the frequency and with the information prescribed by County. Further, at any time, County has the right to demand adequate assurances that the services provided by Contractor shall be in accordance with the Contract. Such assurances provided by the Contractor shall be supported by documentation in Contractor's possession from third parties.

11. CONFIDENTIALITY OF RECORDS

- A. Contractor shall not use, release, or disclose any information concerning any employee, client, applicant or person doing business with the County for any purpose not directly connected with the administration of County's or the Contractor's responsibilities under this Contract except upon written consent of the County, and if applicable, the employee, client, applicant or person.

- B. Contractor shall ensure that its agents, employees, officers, and subcontractors with access to County and Contractor records understand and comply with this confidential provision.
- C. If Contractor receives or transmits protected health information, Contractor shall enter into a Business Associate Agreement with County, which shall become part of this Contract, if attached hereto.
- D. Client records shall be kept confidential in accordance with ORS 179.505, OAR 309-11-020, 45 CFR 205.50 and 42 CFR Part 2 as applicable.

12. INDEMNIFICATION AND INSURANCE

- A. Contractor shall defend, save, indemnify, and hold harmless the County, its officers, agents, and employees from and against all claims, suits, actions, losses, damages, liabilities, costs, and expenses of any nature whatsoever, including attorney fees, resulting from, arising out of, or relating to the activities of Contractor or its officers, employees, subcontractors, or agents under this Contract. Contractor shall have control of the defense and settlement of any claim that is subject to this section. However, neither Contractor nor any attorney engaged by Contractor shall defend the claim in the name of either County or any department of County, nor purport to act as legal representative of either County or any of its departments, without first receiving from County Legal Counsel authority to act as legal counsel for the County, nor shall Contractor settle any claim on behalf of County without the approval of County Legal Counsel. County may, at its election and expense, assume its own defense and settlement.
- B. Contractor shall obtain the insurance required under section 23 prior to performing under this Contract and shall maintain the required insurance throughout the duration of this Contract and all warranty periods.
- C. County, pursuant to applicable provisions of ORS 30.260 to 30.300, maintains a self-insurance program that provides property damage and personal injury coverage.

13. EARLY TERMINATION

This Contract may be terminated as follows:

- A. County and Contractor, by mutual written agreement, may terminate this Contract at any time.
- B. County in its sole discretion may terminate this Contract for any reason on 30 days written notice to Contractor.
- C. Either County or Contractor may terminate this Contract in the event of a breach of the Contract by the other. Prior to such termination the party seeking termination shall give to the other party written notice of the breach and intent to terminate. If the party committing the breach has not entirely cured the breach within 15 days of the date of the notice, then the party giving the notice may terminate the Contract at any time thereafter by giving a written notice of termination.
- D. Notwithstanding section 13C, County may terminate this Contract immediately by written notice to Contractor upon denial, suspension, revocation, or non-renewal of any license, permit or certificate that Contractor must hold to provide services under this Contract.

14. PAYMENT ON EARLY TERMINATION

Upon termination pursuant to section 13, payment shall be made as follows:

- A. If terminated under 13A or 13B for the convenience of the County, the County shall pay Contractor for Work performed prior to the termination date if such Work was performed in accordance with the Contract. County shall not be liable for direct, indirect, or consequential damages. Termination shall not result in a waiver of any other claim County may have against Contractor.
- B. If terminated under 13C by the Contractor due to a breach by the County, then the County shall pay the Contractor for Work performed prior to the termination date if such Work was performed in accordance with the Contract.
- C. If terminated under 13C or 13D by the County due to a breach by the Contractor, then the County shall pay the Contractor for Work performed prior to the termination date provided such Work was performed in accordance with the Contract less any setoff to which the County is entitled.

15. INDEPENDENT CONTRACTOR

- A. The Contractor is a separate and independently established business, retains sole and absolute discretion over the manner and means of carrying out the Contractor's activities and responsibilities for the purpose of implementing the provisions of this contract, and maintains the appropriate license/certifications, if required under Oregon Law. This contract shall not be construed as creating an agency, partnership, joint venture, employment relationship or any other relationship between the parties other than that of independent parties. The Contractor is acting as an "independent contractor" and is not an employee of County and accepts full responsibility for taxes or other obligations associated with payment for services under this contract. As an "independent contractor", Contractor will not receive any benefits normally accruing to County employees unless required by applicable law. Furthermore, Contractor is free to contract with other parties for the duration of the contract.
- B. SUBCONTRACTING/NONASSIGNMENT. No portion of the Contract may be contracted or assigned to any other individual, firm or entity without the express and prior approval of the County.

16. GOVERNING LAW AND VENUE

This Contract shall be governed by the laws of the State of Oregon. Any action commenced in connection with this Contract shall be in the Circuit Court of Marion County. All rights and remedies of the County shall be cumulative and may be exercised successively or concurrently. The foregoing is without limitation to or waiver of any other rights or remedies of the County according to law.

17. OWNERSHIP AND USE OF DOCUMENTS

All documents, or other material submitted to the County by Contractor shall become the sole and exclusive property of the County. All material prepared by Contractor under this Contract may be subject to Oregon's Public Records Laws.

18. NO THIRD-PARTY BENEFICIARIES

- A. County and Contractor are the only parties to this Contract and are the only parties entitled to enforce its terms.

- B. Nothing in this contract gives or provides any benefit or right, whether directly, indirectly, or otherwise, to third persons unless such third persons are individually identified by name in this Contract and expressly described as intended beneficiaries of this Contract.

19. SUCCESSORS IN INTEREST

The provisions of this Contract shall be binding upon and inure to the benefit of the parties and their successors and approved assigns.

20. MERGER CLAUSE

This Contract and the attached exhibits constitute the entire agreement between the parties.

- A. All understandings and agreements between the parties and representations by either party concerning this Contract are contained in this Contract.
- B. No waiver, consent, modification or change in the terms of this Contract shall bind either party unless in writing signed by both parties.
- C. Any written waiver, consent, modification, or change shall be effective only in the specific instance and for the specific purpose given.

21. WAIVER

The failure of any Party to enforce any provision of this Contract shall not constitute a waiver by that Party or any other provision. Waiver of any default under this Contract by any Party shall not be deemed to be a waiver of any subsequent default or a modification of the provisions of this Contract.

22. REMEDIES

In the event of breach of this Contract, the Parties shall have the following remedies:

- A. If terminated under 13C by County due to a breach by the Contractor, the County may complete the Work either itself, by agreement with another Contractor, or by a combination thereof. If the cost of completing the Work exceeds the remaining unpaid balance of the total compensation provided under this Contract, then the Contractor shall pay to the County the amount of the reasonable excess.
- B. In addition to the remedies in sections 13 and 14 for a breach by the Contractor, County also shall be entitled to any other equitable and legal remedies that are available.
- C. If County breaches this Contract, Contractor's remedy shall be limited to termination of the Contract and receipt of Contract payments to which Contractor is entitled.

23. INSURANCE

- A. **REQUIRED INSURANCE.** Contractor shall obtain at Contractor's expense the insurance specified in this section prior to performing under this Contract and shall maintain it in full force and at its own expense throughout the duration of this Contract and all warranty periods. Contractor shall obtain the following insurance from insurance companies or entities that are authorized to transact the business of insurance and issue coverage in Oregon and that are acceptable to County:
 - i. **WORKERS COMPENSATION.** All employers, including Contractor, that employ subject workers, as defined in ORS 656.027, shall comply with ORS 656.017 and shall provide workers'

compensation insurance coverage for those workers, unless they meet the requirement for an exemption under ORS 656.126(2). Contractor shall require and ensure that each of its subcontractors complies with these requirements.

- ii. **PROFESSIONAL LIABILITY.** Covering any damages caused by an error, omission or any negligent acts related to the services to be provided under this Contract. Contractor shall provide proof of insurance of not less than the following amounts as determined by the County:

- ☐ **Required by County** ☒ **Not required by County.**
☐ \$1,000,000 Per occurrence limit for any single claimant; and
☐ \$2,000,000 Per occurrence limit for multiple claimants
☐ Exclusion Approved by Risk Manager

- iii. **CYBER LIABILITY.** Covering network security, breach of data, and coverage for regulatory fines and fees imposed against County due to failures in products and services provided under this Contract. Cyber Liability coverage must include errors, omissions, negligent acts, denial of service, media liability (including software copyright), dishonesty, fraudulent or criminal acts by a person or persons whether identified or not, intellectual property infringement, computer system attacks, unauthorized access and use of computer system, regulatory actions, and contractual liability.

- ☐ **Required by County** ☒ **Not required by County.**
☐ \$2,000,000 Per occurrence limit for any single claimant; and
☐ \$5,000,000 Per occurrence limit for multiple claimants
☐ Exclusion Approved by Information Technology Director and Risk Manager

- iv. **COMMERCIAL GENERAL LIABILITY.** Covering bodily injury, death, and property damage in a form and with coverages that are satisfactory to the County. This insurance shall include personal injury liability, products and completed operations. Coverage shall be written on an occurrence basis. Contractor shall provide proof of insurance of not less than the following amounts as determined by the County:

- ☒ **Required by County** ☐ **Not required by County.**

Minimum Limits:

- ☒ \$1,000,000 Per occurrence limit for any single claimant; and
☒ \$2,000,000 Per occurrence limit for multiple claimants
☐ Exclusion Approved by Risk Manager
☐ \$500,000 Per occurrence limit for any single claimant
☐ \$1,000,000 Per occurrence limit for multiple claimant

- v. **AUTOMOBILE LIABILITY INSURANCE.** Covering all owned, non-owned, or hired vehicles. This coverage may be written in combination with the Commercial General Liability Insurance (with separate limits for "Commercial General Liability" and "Automobile Liability"). Contractor shall provide proof of insurance of not less than the following amounts as determined by the County:

- ☒ **Required by County** ☐ **Not required by County.**

Minimum Limits:

- ☐ Oregon Financial Responsibility Law, ORS 806.060 (\$25,000 property damage/\$50,000 bodily injury \$5,000 personal injury).
- ☒ \$500,000 Per occurrence limit for any single claimant; and
- ☒ \$1,000,000 Per occurrence limit for multiple claimants
- ☐ Exclusion Approved by Risk Manager

- B. **ADDITIONAL INSURED.** The Commercial General Liability insurance required under this Contract shall include Marion County, its officers, employees, and agents as Additional Insureds but only with respect to Contractor's activities to be performed under this Contract. Coverage shall be primary and non-contributory with any other insurance and self-insurance.
- C. **NOTICE OF CANCELLATION OR CHANGE.** There shall be no cancellation, material change, potential exhaustion of aggregate limits or non-renewal of insurance coverage(s) without 30 days written notice from this Contractor or its insurer(s) to County. Any failure to comply with the reporting provisions of this clause shall constitute a material breach of Contract and shall be grounds for immediate termination of this Contract by County.
- D. **CERTIFICATE(S) OF INSURANCE.** Contractor shall provide to County Certificate(s) of Insurance for all required insurance before delivering any Goods and performing any Services required under this Contract. The Certificate(s) must specify all entities and individuals who are endorsed on the policy as Additional Insured (or Loss Payees). Contractor shall pay for all deductibles, self-insured retention, and self-insurance, if any.

24. NOTICE

Except as otherwise expressly provided in this contract, any communications between the parties hereto or notices to be given hereunder shall be given in writing, to Contractor or County at the address or number set forth below or to such other addresses or numbers as either party may hereafter indicate in writing. Delivery may be by personal delivery, or mailing the same, postage prepaid.

- A. Any communication or notice by personal delivery shall be deemed delivered when actually given to the designated person or representative.
- B. Any communication or notice mailed shall be deemed delivered five (5) days after mailing. Any notice under this Contract shall be mailed by first class postage delivered to:

To Contractor:

Ash Creek Forest Management
2796 SE 73rd Ave
P.O. Box 263
Hillsboro, Oregon 97123
Phone No. 503-624-0357

To County

Procurement & Contracts Manager
555 Court Street NE, Suite 5232
P.O. Box 14500
Salem, Oregon 97309
Fax No. 503-588-5237

25. SURVIVAL

All rights and obligations shall cease upon termination or expiration of this Contract, except for the rights and obligations set forth in sections 2, 7, 8, 9, 10, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 25 and 26.

26. SEVERABILITY

If any term or provision of this Contract is declared illegal or in conflict with any law by a court of competent jurisdiction, the validity of the remaining terms and provisions that shall not be affected and the rights and obligations of the parties shall be construed and enforced as if the Contract did not contain the particular term or provision held to be invalid.

27. CONTRACTOR'S REPRESENTATIONS AND WARRANTIES

Contractor represents and warrants to the County that:

- A. Contractor has the power and authority to enter into and perform this Contract.
- B. This Contract, when executed and delivered, is a valid and binding obligation of Contractor, enforceable in accordance with its terms.
- C. Contractor (to the best of Contractor's knowledge, after due inquiry), for a period of no fewer than six calendar years preceding the effective date of this Contract, faithfully has complied with:
 - i. All tax laws of this state, including but not limited to ORS 305.620 and ORS chapters 316, 317, and 318;
 - ii. Any tax provisions imposed by a political subdivision of this state that applied to Contractor, to Contractor's property, operations, receipts, or income, or to Contractor's performance of or compensation for any work performed by Contractor;
 - iii. Any tax provisions imposed by a political subdivision of this state that applied to Contractor, or to goods, services, or property, whether tangible or intangible, provided by Contractor; and
 - iv. Any rules, regulations, charter provisions, or ordinances that implemented or enforced any of the foregoing tax laws or provisions.
- D. Any Goods or Services granted to the County under this Contract, and Contractor's Services rendered in the performance of Contractor's obligations under this Contract, shall be provided to the County free and clear of any and all restrictions on or conditions of use, transfer, modification, or assignment, and shall be free and clear of any and all liens, claims, mortgages, security interests, liabilities, charges, and encumbrances of any kind.

28. **CERTIFICATIONS AND SIGNATURE. THIS CONTRACT MUST BE SIGNED IN INK BY AN AUTHORIZED REPRESENTATIVE OF CONTRACTOR**

The undersigned certifies under penalty of perjury both individually and on behalf of Contractor is a duly authorized representative of Contractor, has been authorized by Contractor to make all representations, attestations, and certifications contained in this Contract and to execute this Contract on behalf of Contractor.

**MARION COUNTY SIGNATURES
BOARD OF COMMISSIONERS:**

Chair _____ Date _____

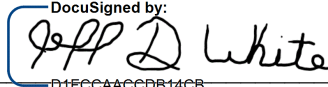
Commissioner _____ Date _____

Commissioner _____ Date _____

Authorized Signature:  1/13/2023
DocuSigned by:
9793BA7ACD6D443...
Department Director or designee _____ Date _____

Authorized Signature: _____
Chief Administrative Officer _____ Date _____

Reviewed by Signature: _____
Marion County Legal Counsel _____ Date _____

Reviewed by Signature:  1/13/2023
DocuSigned by:
D1FCCAACCB14CB...
Marion County Contracts & Procurement _____ Date _____

ASH CREEK FOREST MANAGEMENT LLC SIGNATURE

Authorized Signature: _____
Date _____

Title: _____

EXHIBIT A STATEMENT OF WORK

1. STATEMENT OF SERVICES

Contractor shall perform Services as described below.

- A. GENERAL INFORMATION. Marion County Public Works manages 250.69 acres of parkland over seven different parks and 137.23 acres of right-of-way, which has been affected by the 2020 Beachie Creek wildfire in the Santiam Canyon. Marion County, along with various Federal, State, and local partners has completed hazard tree mitigation work and is preparing long-term plans for restoration throughout these public lands. The County requires services for the restoration process on these lands through targeted native plant restoration and noxious weed mitigation. Additionally, Marion County Public Works manages 7.5 acres of Federal and State permitted County Project Mitigation areas currently spread over eight sites throughout the county that require vegetation management and noxious weed mitigation services. These services are typically performed 2-4 times per year and have individual permit requirements for each site. Marion County Public Works requires vegetation and forest management services for both fire-affected and non-fire affected county property, as described herein.
- B. REQUIRED SERVICES, DELIVERABLES AND DELIVERY SCHEDULE. Contractor shall perform services including, but not limited to:
 - I. Manual Site Preparation and Maintenance
 - a. Backpack Spot or Area Spray – Contractor shall apply a County-approved herbicide in a volume sufficient to adequately cover all target vegetation at the site, ensuring it is wet but not dripping. County shall approve the chemical concentration and surfactant to be used. Contractor shall use sufficient dye in the tank mix such that sprayed areas are easily visible to the County Project Manager. Target vegetation may include all vegetation within a target area, or may be limited to species or a subset of species included on the Oregon Noxious Weed List maintained by the Oregon Department of Agriculture <https://www.oregon.gov/ODA/programs/Weeds/OregonNoxiousWeeds/Pages/AboutOregonWeeds.aspx>. Contractor is solely responsible for preventing damage to existing native or desirable vegetation and/or existing vegetation.
 - b. Hack and Squirt - Contractor shall treat target woody plants by making cuts totaling not less than 60% of the plant's circumference through the bark and cambium layers and injecting or spraying (at low pressure) a County-approved herbicide and concentration into cuts. County project manager or representative may direct Contractor to girdle targeted species, by making cuts totaling 100% of the plant's circumference through the bark and cambium layers, which at the County project manager or representative's discretion may or may not include injecting or spraying (at low pressure) a County-approved herbicide and concentration into cuts.
 - c. Cut Stump - Contractor shall treat target woody plants by cutting the plant to the ground and immediately applying a County-approved herbicide and concentration to the entire cut portion of the stump.

- d. Hand Mow/Cut - Contractor shall cut target vegetation in planted project sites using handheld equipment (e.g., saws, shears, trimmers, etc.) to the specified height. Target vegetation may include all vegetation that is not planted by the County or may include species on the Oregon Department of Agriculture Noxious Weed List: <https://www.oregon.gov/ODA/programs/Weeds/OregonNoxiousWeeds/Pages/AboutOregonWeeds.aspx>. Contractor is responsible for recognizing and preventing damage to existing native or desirable vegetation and existing vegetation.
- e. Push Mow - Contractor shall cut target vegetation using pedestrian equipment (field and brush mowers or other similar equipment) to the specified height. Target vegetation may include all vegetation that is not planted by the County. Contractor is responsible for recognizing and preventing damage to existing native or desirable vegetation and/or existing vegetation.
- f. Tree Cutting - Contractor shall provide a qualified faller to cut and fall nuisance trees marked or otherwise designated by the County project manager or representative. Unless directed otherwise, the following specs shall apply:
 - i. Directional Falling. Trees shall be fallen directionally to avoid damage to leave trees. Fallers will utilize standard techniques such as the use of face cuts, back cuts, holding wood and wedges.
 - ii. Stump height. Stumps of all felled trees shall be cut to a height of no more than one foot from the ground on the uphill side or cut flush to the ground in areas designated by the County project manager or representative. To minimize soil disturbance, tree stumps shall not be grubbed or otherwise removed. The County will typically require stumps to be flush cut.
 - iii. Leave trees. No felling, girdling, or topping of, or other damage to leave trees shall be allowed. In the event that a leave tree is damaged during the course of project operations, Contractor shall notify the County project manager. Damage to leave trees shall result in a suspension of operations until adequate precautions are taken to prevent additional damage to these and other trees.
 - iv. Limbing. County project manager or representative shall direct the Contractor to limb branches on fallen trees to prepare the material for slash piling or chipping.
 - v. Bucking. If necessary, County project manager or representative shall direct the Contractor to buck fallen trees into varying lengths. Contractor shall not buck trees without specific instruction to do so.
- g. Cut Blackberry/Brush - Contractor shall cut Armenian/Himalayan blackberry (*Rubus armeniacus*/R.*discolor*), evergreen blackberry (*R. laciniatus*) and other target brush to the ground and shall cut stems to less than 8 inches in length above mineral soil using manual or mechanical means. Contractor is responsible for recognizing and preventing damage to existing native vegetation.

- h. Backpack Ring or Row Spray - Contractor shall apply a County-approved herbicide in a volume sufficient to adequately cover all target vegetation within a circle of planted and naturally recruited native vegetation so that it is wet but not dripping. The County or its representative must approve the chemical concentration and surfactant to be used prior to the start of work; Contractor shall use sufficient dye in the tank mix such that sprayed areas are easily visible to the County project manager. The County project manager will specify whether the work is a circle or line spray and will specify circle size (if applicable) prior to work start. Contractor is responsible for recognizing and preventing damage to existing native or desirable vegetation and existing vegetation.

II. Mechanical Site Preparation, Seeding, and Maintenance

- a. Machine Broadcast or No-Till Drill Seed - Contractor shall apply seed to project sites using machine seed spreaders or no-till drills at a rate determined by County project manager or representative (typically between five (5) and fifteen (15) pounds per acre). The seeding equipment shall be subject to the equipment cleaning requirements listed herein.
- b. Boom Spray or Boomless Nozzle Spray - Contractor shall apply a County-approved herbicide using a tractor, UTV, ATV or other equipment in a volume sufficient to adequately cover all target vegetation at the site so that it is wet but not dripping. The County or its representative must approve the herbicide, application rate, and surfactant prior to starting work. Target vegetation may include all vegetation that is not planted or may be limited to species included on the Oregon Department of Agriculture Noxious Weed List (<https://www.oregon.gov/ODA/programs/Weeds/OregonNoxiousWeeds/Pages/AboutOregonWeeds.aspx>). Contractor is responsible for recognizing and preventing damage to existing native or desirable vegetation and/or existing vegetation on adjacent land.
- c. Field Flail or Mow - Contractor shall flail or mow target vegetation using a walk-behind mower or other mowing equipment. Contractor is responsible for recognizing and preventing damage to existing native vegetation and/or landscaping vegetation. Mowing shall not be performed when the ground conditions are such that the equipment will damage the terrain or cause erosion. The mowing equipment shall be subject to the equipment cleaning requirements listed herein.
- d. Field Mowing Between Planting Rows or Clusters of Plants - Contractor shall flail or mow target vegetation using a walk-behind mower or other mowing equipment between six (6) and nine (9) foot planting rows or plantings in clusters in a field. Contractor shall mow to within one (1) foot of edge of cluster plantings. Contractor is responsible for recognizing and preventing damage to existing native vegetation and/or landscaping vegetation. Mowing shall not be performed when the ground conditions are such that the equipment will damage the terrain or cause erosion. The mowing equipment shall be subject to the equipment cleaning requirements listed herein.

- e. Tree and Shrub Mastication - Contractor shall masticate trees and shrubs with a mechanized masticator. Equipment shall be able to masticate trees and shrubs to ground level. In some cases, the County project manager or representative may require stumps left exposed for herbicide application.
- f. Tree Shearing - Contractor shall shear trees with a mechanized tree shearer. Equipment shall be able to shear at ground level. County project manager or representative shall indicate pile locations. Contractor shall treat stumps immediately with a County-approved herbicide and concentration.
- g. Tree and Brush Chipping with Portable Chipper or Tub Grinder - As directed by the County, a portable chipper shall be temporarily housed on site to chip felled nuisance trees and shrubs to mulch slash for removal from the site. The chipper must be capable of blowing chipped material directly into a dumpster or trailer for hauling. The chipper shall be subject to the equipment cleaning requirements listed herein. Temporary siting of the portable chipper must be approved by the County project manager or representative. Equipment contracted under this agreement shall be subject to the fueling and equipment repair restrictions described herein.
- h. Hauling Chips or Biomass - As directed by County, Contractor shall provide a vehicle to transport chips or biomass generated from mechanical site preparation activities. Vehicles may include dump trucks, trucks with dumpsters, or similar equipment. Vehicles shall only operate on roads marked by the County project manager or representative and speed shall not exceed 15 miles per hour on any gravel access drives or private drives. Equipment contracted under this agreement shall be subject to the fueling and equipment repair restrictions described herein. County shall reimburse Contractor for the cost of all documented disposal fees resulting from work that has been pre-approved by County, as described herein.

III. Planting

- a. Scalp - Contractor shall prepare individual planting spots by scraping away all live and dead vegetation, roots, and rhizomes from a 16-inch diameter circle unless otherwise specified. Where the slope of the ground is greater than 20 percent, Contractor shall also construct a flat planting area.
- b. Hand or Crank Broadcast Seed - Contractor shall apply seed mixed with or without cracked corn or other approved spreading medium to project sites by hand or using hand crank spreaders at a rate specified by the County (typically between five (5) and twenty-five (25) pounds per acre).
- c. Plant Small Bare Root Plants - Contractor shall plant one- and two-year old bare root plants (typically less than twenty-four (24) inches tall above the root crown) in row or random arrangements or as directed by County's project manager or representative.
- d. Plant Large Bare Root Plants - Contractor shall plant three-year and older old bare root plants (typically greater than twenty-four (24) inches tall above the root crown)

in row or random arrangements or as directed by the County's project manager or representative. Contractor shall transport, protect, handle and plant bare root plants as follows:

- i. Protection of Plant Materials during Transport. Contractor shall be responsible for transporting plant material to the project site either in fully enclosed trailers or trucks with canopies. Open-bed trucks may be used only if Contractor covers plant materials with insulating blankets or tarps to protect plant materials from wind damage and freezing. Plant material shall not be transported in heated crew vehicles.
- ii. Protection of Plant Materials on Project Site. Contractor shall keep plants covered at all times using either light colored or white tarps or insulating blankets and shall protect all plant material from loss, destruction or damage of any kind, including physical injury, freezing, heating or drying. Contractor shall be responsible for all loss, destruction or damage to plant material that occurs from the time Contractor takes possession of the plant material until the plant material is planted. Contractor is responsible for inspecting plants/bags upon pickup to verify plants are in good health.
- iii. Handling of Plant Materials during Planting. Contractor shall ensure that plant root systems are in a dripping wet state prior to planting. If necessary, Contractor shall dip the entire root system of all plants in water upon removing the plants from the storage bag and shall then place plants directly into a planting bag. Plant material shall be carried into planting areas only in County-approved planting bags. The quantity of seedlings placed in a planting bag shall be limited to that which allows the removal of individual seedlings without damage to tops or roots. Contractor shall remove only one seedling at a time from a planting bag and only after the planting hole has been prepared. Contractor shall not cull plant material or prune roots or stems unless directed by County.
- iv. Plant Placement. Contractor shall plant bare-root plant material at various planting densities as directed by County project manager or representative or as indicated in any Work Order that addresses the project. The County may also specify where certain plant species or associations of plant species are to be planted within each project area. Plant material planted in inappropriate places will be subject to rejection by County during inspections. Inappropriate places are places where logs, compacted slash greater than 18 inches in depth, rock outcrops, cobble, gravel, standing water or other media prevent planting tools from making an acceptable planting hole. When an inappropriate place is encountered, Contractor shall plant the plant material in the nearest appropriate location.
- v. Planting Technique. Contractor shall plant using the Rapid Riparian Revegetation (R3) method, as outlined in Attachment 2.

- vi. County's Right to Suspend Planting. The County may suspend planting work if the County determines that weather conditions could damage plant material even if the material is handled in accordance with this Contract. County may also suspend planting work at any time if the County determines that Contractor is not handling plants or planting in accordance with this Contract.
- e. Plant Container Plants - Contractor shall plant either one-gallon or similarly sized container plants in row or other arrangement as directed. Contractor shall transport, protect, handle and plant plants as follows:
 - i. Protection of Plant Materials. Contractor shall protect all plant material from loss, destruction or damage of any kind, including physical injury, freezing, heating or drying. Plant materials shall not be transported in heated crew vehicles. Contractor shall be responsible for all loss, destruction or damage to plant material that occurs from the time Contractor takes possession of the plant material until the plant material is planted.
 - ii. Handling of Plant Materials during Planting. Contractor shall carry plants by their containers to project site without damaging stems or leaves. Contractor shall not prune roots or stems.
 - iii. Plant Placement. Contractor shall plant container plants at various planting densities as directed by County or as indicated in any Work Order that addresses the project. County may also specify where certain plant species or associations of plant species are to be planted within each project area. Plant material planted in inappropriate places will be subject to rejection by County during inspections. Inappropriate places are places where logs, compacted slash greater than 18 inches in depth, rock outcrops, cobble, gravel, standing water or other media prevent planting tools from making an acceptable planting hole. When an inappropriate place is encountered, Contractor shall plant the plant material in the nearest appropriate location.
 - iv. Planting Technique. Contractor shall prepare a planting hole that is twice as wide and the same depth as the plant root ball. If root bound, Contractor shall break up roots and eliminate any circling roots prior to planting. Each plant shall be set firmly in the ground, with moist soil filled in and placed firmly around the roots. There shall be no air pockets adjacent to or near the roots. Contractor shall level the soil near the plant after planting and firming so that there are no depressions or mounds near the stem.
 - v. County's Right to Suspend Planting. The County may suspend planting work if the County determines that weather conditions could damage plant material even if the material is handled in accordance with this Contract. County may also suspend planting work at any time if the County determines that Contractor is not handling plants or planting in accordance with this Contract.

- f. Plant Plugs, Bulbs, or Root Fragments - Contractor shall plant herbaceous plugs using picks, dibble sticks, hand trowels, or bare-root planting shovels. County project manager or representative will specify the planting density at the time of the planting. Planting depth varies by species.
- g. Harvest Small Pole Cuttings - Contractor shall harvest 18- to 24-inch-long pole cuttings from sites indicated by County project manager or representative. Upon harvest, Contractor shall arrange cuttings so that the bottoms and tops are in the same direction and place cuttings bottom end first in bundles of 100 in buckets with water. Cuttings shall be kept on site and covered with light-colored tarps or in water at all times until they are planted. Contractor shall harvest no more than one-third of the donor plant's branches.
- h. Harvest Large Pole Cuttings - Contractor shall harvest 24- to 48-inch-long pole cuttings from sites indicated by County project manager or representative. Upon harvest, Contractor shall arrange cuttings so that the bottoms and tops are in the same direction and place cuttings bottom end first in bundles of 100 in buckets with water. Cuttings shall be kept on site and covered with light-colored tarps or in water at all times until they are planted.
- i. Plant Small Pole Cuttings - Contractor shall plant 18- to 24-inch-long pole cuttings at density indicated by County project manager or representative. Contractor shall insert a pole cutting into the ground to a depth equal to two-thirds of its total length. County project manager or representative may direct Contractor to plant the cuttings vertically, perpendicular to the ground surface, or at another angle as directed by County. Pole cuttings shall be planted bottom end first. Contractor shall remove and replace any cuttings that are broken, skinned during planting, planted upside down, and/or not planted to the proper depth.
- j. Plant Large Pole Cuttings - Contractor shall plant 24- to 48-inch-long pole cuttings at density indicated by County project manager or representative. Contractor shall insert pole cuttings into the ground to a minimum depth of 18 inches. County project manager or representative may direct Contractor to plant the cuttings vertically, perpendicular to the ground surface, or at another angle. Pole cuttings shall be planted bottom end first. Contractor shall remove and replace any cuttings that are broken, skinned during planting, planted upside down, and/or not planted to the proper depth.
- k. Auger Planting – Specs for standard auger planting are as follows:
 - i. 4-inch hole using true augur with sealed chaincase (e.g., not a chainsaw-adapted augur that can leak oil)
 - ii. Hole will be 30 inches deep
 - iii. Fill hole with 3-5 pole cuttings that are each 36-48 inches long and approximately 1 inch in diameter

- iv. Use rubber mallet to pound pole cuttings 2-3 inches into soil at base of augured hole
 - v. Use chainsaw to flush cut top of pole cuttings if damaged
 - vi. Carefully and thoroughly refill the remaining portion of the augured hole and step the soil down firmly and completely around pole cuttings, to seal the planting hole
- l. Apply Mulch - Contractor shall apply mulch in the form of wood chips or shavings around each planted plant. Mulch shall be spread in a 16-inch diameter circle to a depth of three inches without covering the plant stem. County project manager or representative may change the quantity and kind of mulch material when warranted by site conditions.
- m. Mark Plants with Stakes - Contractor shall install a bamboo or wooden stake up to 48-inch in length adjacent to planted trees and shrubs. Stakes shall be driven vertically into the ground at a location four inches from the base of the plant, and to a minimum depth of nine inches. Bamboo stakes shall be installed with the larger diameter end in the ground.
- n. Mark Plants with Flagging Tape - Contractor shall tie a six-inch piece of flagging to planted trees and shrubs. Flagging tape shall be tied to a lateral branch near the top of the plant.
- o. Install Vexar or Equivalent Tube and Stakes - Contractor shall position the bottom end of the tube so that it is in full contact with the ground. Contractor shall anchor each plant tube to the ground using two stakes. Contractor shall weave a vertical stake 48 inches in length through the tube webbing a minimum of four times and insert it into the ground to a minimum depth of nine inches. Stakes shall be on the inside of the bottom of the tube and installed with the larger diameter end in the ground. Contractor shall further secure the tube using a 24-inch-long stake placed diagonally to a depth of six inches and woven twice between the tube and vertical stake. The tube shall be centered on the plant, and shall be installed so that it remains in full contact with the ground when subjected to a moderate upward tug. The maximum allowed lean of the tube is two inches from vertical, measured from the top of the tube.
- i. Contractor shall not damage the plant during tube installation and, if necessary, shall reach into the tube to ensure that branches are in a natural position. Plants with skinned bark, a broken terminal leader, a curled leader inside the tube, or a leader protruding through the side of the tube will be subject to rejection by County project manager or representative. Contractor shall discard and replace stakes broken during installation. Where rocky ground prevents driving the stakes to the full depth on the first attempt, the stake shall be moved to a location where the tube can be driven to the required depth. If soil conditions prevent proper stake installation on many

plants throughout a planting site, Contractor shall notify County project manager or representative.

- p. Install Solid Blue Tree Protection Tube or Equivalent Stakes - Contractor shall position the bottom end of the completely joined/closed tube so that it is in full contact with the ground. The tube shall be closed by a minimum of three cable ties. Contractor shall anchor each plant tube to the ground using a single 4-foot bamboo stake. The stake shall be located on the inside of the tube, and will be inserted through the cable ties used to close the tube. The tube shall be centered on the plant, and shall be installed so that it remains in full contact with the ground when subjected to a moderate upward tug. The maximum allowed lean of the tube is two inches from vertical, measured from the top of the tube.
- i. Contractor shall not damage the plant during tube installation and, if necessary, shall reach into the tube to ensure that branches are in a natural position. Plants with skinned bark, a broken terminal leader, a curled leader inside the tube, or a leader protruding through the side of the tube will be subject to rejection by County project manager or representative. Contractor shall discard and replace stakes broken during installation. Where rocky ground prevents driving the stakes to the full depth on the first attempt, the stake shall be moved to a location where the tube can be driven to the required depth. If soil conditions prevent proper stake installation on many plants throughout a planting site, Contractor shall notify County project manager or representative.

IV. Survey and Monitoring

Contractor will have access to approximate project boundary maps provided by County. Contractor will be expected to interpret on-the-ground conditions (i.e. fences), approximate boundary maps, and other factors to determine, as accurately as possible, the approximate on the ground boundaries of the project area. Contractor will be responsible for monitoring and documenting noxious weeds and mitigation. However, it is expected that Contractor will promptly inform County of any additional noxious weeds discovered on project sites. Survey and monitoring will require the use of drones and GIS and Contractors should demonstrate appropriate ability to incorporate these tools into project sites and planning efforts.

V. Aquatic Site Preparation, Maintenance, Survey and Monitoring

Some of the targeted species being treated by the County are found in and along lakes, reservoirs, ponds, rivers, creeks, and riparian corridors, where they spread with moving water. All tasks outlined in Sections I-IV may be performed on or near aquatic sites. Contractor shall follow all Federal, State, and Local regulations with regards to aquatic noxious weed and vegetation management when performing tasks within aquatic sites.

VI. Project Management

Project Management includes those services requested by County that are above and beyond the completion of work tasks described in this Scope of Work. Examples of Project Management include

but are not limited to: additional site visits, site monitoring, telephone calls, landowner consultations, or other related activities. Selected contractor will be required to coordinated with multiple County project managers based on specific sites. All work must be pre-approved by County and scheduled at least 48 hours in advance to ensure proper notice to County personnel involved in the management of each site.

For instream and aquatic work, Project Management will also include securing access points and addressing logistics associated with mobilization from access points within the targeted waterbody.

Project Management also includes consultation with County project manager or their designee(s) to address unforeseen challenges as need to meet project goals and contract requirements

VII. Use of Herbicide

The specific amount of herbicide used will be in accordance with the label requirements and County-prescribed Best Management Practices (BMPs). Unless otherwise directed by the County project manager or representative, herbicides shall not be applied when wind speed is greater than five (5) mph or when the National Weather Service forecast calls for precipitation within 24 hours or when manufacturer specifications do not recommend or prohibit application. There shall be no over-spray of herbicides onto native vegetation. Where necessary, Contractor shall manually or mechanically clear target vegetation away from native or desirable vegetation to protect native or desirable vegetation during spraying. In all cases, the spray mixture shall contain a colorant in the amount of one (1) percent or greater of the mixture. Contractor shall post County-approved public notice signs with legal re-entry periods at all public access points prior to spraying and will leave the signs on-site until re-entry periods are satisfied. Contractor shall remove signs when re-entry periods are satisfied.

Contractor shall submit copies of herbicide application records for all herbicide work with each invoice to the County.

Contractor shall maintain appropriate licensing and shall present copies of operator, applicator, and trainee licenses at the County's request. The County is not responsible for payment to Contractor in the event that Contractor fails to provide documentation upon request.

Contractor shall maintain all pesticide treatment records for all work carried out on County projects. Pesticide treatment records will comply with all recordkeeping and retention standards required by law. All pesticide treatment records related to County projects must be submitted along with all invoices. The County is not responsible for payment to Contractor in the event that Contractor fails to provide required documentation.

Pesticide treatments occurring within three (3) feet of water require additional record keeping. The County is a registrant under the Oregon DEQ administered NPDES 2300A Pesticide permit. The County is required to report all applications by employees and Contractors that occur within three (3) feet of water. In addition to standard herbicides records, the Contractor will be required to maintain records for all herbicide treatments carried out within three (3) feet of standing water. Treatment areas must include the following:

- Site name;
- Impacted water body;

- Length of wetted edge treated (ft)
- Area treated (ft²);
- Date of application;
- Targeted pest(s);
- Name of pesticide operator;
- License number of operator;
- Name of pesticide applicator(s);
- License number of pesticide applicator(s);
- Herbicide(s) used:
 - Trade name:
 - EPA registration:
 - Application method:
 - Treatment method:
 - Total volume solution applied (fl oz):
 - Total volume active ingredient applied (fl oz):

A record of herbicide use within three feet of water must be reported to the County within fourteen days of the herbicide application. If Contractor is also a registrant under the 2300A Pesticide Permit, all spray records for prescribed work will be reported to DEQ through the County's required NPDES 2300A annual report.

VIII. Disposal of Waste Material

At the conclusion of work each day, Contractor shall gather and lawfully dispose of all empty boxes, bags, damaged containers, garbage, and other waste material in a manner acceptable to the County.

The County will reimburse Contractor for the cost of all disposal fees. Contractor shall submit receipts of incurred disposal fees with each invoice to the County.

IX. Role of the County Project Manager

The County and Contractor acknowledge that certain elements of site work in the environmental restoration field are not easily addressed in written plans or designs, and are better addressed in the field while work is underway.

Accordingly, the County shall appoint a project manager or representative to make decisions concerning plant placement, planting technique, employment of specific site preparation and maintenance techniques, the timing of haying, locations for slash piles and other issues. The parties anticipate that most decisions made by the County project manager or representative will not affect Contractor's costs or the terms of the work in this Contract that address the project.

The County's use of a project manager to identify work elements on the project site and monitor field work will not relieve Contractor of responsibility for complying with the terms of this Contract or any amendment to this Contract.

X. Inspection of Work/Acceptance

The County's project manager or designated representative will perform on-the-ground inspection surveys and/or review of documentation for compliance with all specifications on all work items. These will be used as a basis for acceptance, payment, and recommendations for adjustment in work quality. Inspected units of work must comply with all applicable specifications.

Inspections and/or reviews shall identify any deviations from the specifications. Any such deviation shall be corrected immediately. Inspections and/or reviews shall primarily be visual. When the site does not appear to meet contract specifications, inspection data shall be gathered from well-distributed, randomly selected plots of various sizes with a total sample size of at least one (1) percent of each item in every project area.

The County's project manager or designated representative will also inspect project sites up to 40 days following herbicide application to check for effectiveness and damage to non-target vegetation. The County's project manager or designated representative may, at their discretion, inspect project areas as a whole after they are completed. Contractor is encouraged to observe these inspections while they are underway.

a. Satisfactory Work Quality

For all items on each project area, the County or its representatives will assess a work quality percentage by dividing acceptable units inspected by total work units inspected. A minimum work quality standard of 90 percent is required for all work items.

b. Unsatisfactory Work Quality

Work quality below 90 percent will be considered unsatisfactory. Based on inspection results, if work quality is determined to be unsatisfactory, Contractor shall be required to rework the unit of work until satisfactory work quality is achieved.

Based on inspection results, if the work quality percentage falls below 90 percent, the County will immediately notify Contractor in writing and instruct Contractor to improve the quality of the work. If the quality of the work is not raised to a satisfactory and acceptable level within two (2) consecutive workdays after written notification, the County may cancel the Work Order. If the work is seriously or chronically deficient, Contractor recognizes that the County may elect to terminate the Contract in accordance with Section 13 – Early Termination of the Contract.

XI. Notification of Subcontracting

Contractor shall notify County in writing upon entering into any subcontracting arrangement as applicable to the work described herein. This notification shall include at a minimum:

- Name, address, and telephone number of subcontractor;
- Date upon which the subcontract was established and its duration;
- List of tasks from the Scope of Work that will be subcontracted;
- Copies of subcontractor's representative authority (i.e. Oregon Farm/Forest/Landscape Contractor's License, Farm Labor Contractor Certificate of Registration, if applicable) and liability insurance certificate(s); and

- Copies of Oregon Commercial Operator License, Oregon Commercial Applicator License, and Trainee Licenses, if applicable.

XII. Damage to Native Vegetation

Contractor acknowledges that the County incurs damages when native or desirable vegetation is damaged or destroyed by Contractor. Such damage may include the cost of plant material, additional Contract administration by County employees, and the loss of plant growth that would enhance resource values. Because the extent of these damages is often difficult to determine, Contractor hereby agrees to pay fixed, agreed, and liquidated damages at the rate of \$5.75 per plant for every native plant destroyed by Contractor in excess of five (5) percent of the native plants within the project area plots inspected under Section 10 of this Scope of Work.

XIII. Damage to Real Property

In the event Contractor causes damage to County property, cooperating landowners' properties, or neighboring properties while engaging in activities allowed under this Scope of Work, Contractor shall be responsible for correcting the situation and shall incur all costs associated with such corrective action.

XIV. Work Hours

All field work shall be performed Monday through Friday during daylight hours unless County Project Manager or representative grants permission to do otherwise. Contractor shall obey all applicable noise ordinances in completion of work. Contractor shall avoid working on County-observed holidays, unless County Project Manager or representative grants permission to do otherwise.

XV. Equipment Cleaning

The County requires all mechanized equipment to be cleaned (pressure washed or blown with pressurized air) before moving into the project area to reduce the risk of spreading noxious weed seeds and soil pathogens. The County may request to inspect equipment before bringing equipment into the project area. Equipment inspection will be arranged with the County project manager or representative and conducted at a location that is mutually agreed to by the County and the Contractor.

Contractor shall ensure that all equipment, vehicles, and worker boots and clothing are free of mud, dirt, debris, and plant materials to prevent introduction of weed seeds. At no time shall equipment or personnel arrive at a project site with mud, dirt, debris, or plant materials present.

The County project manager or representative upon discovery of what they deem to be unsatisfactory condition of equipment, vehicles, boots or clothing may, at their discretion, require work stoppage and removal of offending items until the problem is remediated.

Upon arrival at a site Contractor and/or County project manager or representative shall agree upon a staging area for implementation of work. This staging area will also serve as a decontamination area

for equipment prior to leaving the site. A thorough cleaning of all equipment, vehicles, and worker boots and clothing is required prior to leaving the work site.

During a workday, Contractor personnel shall periodically check clothing, boots, machinery and tools and equipment for weed seeds and plant fragments. Contaminated equipment and clothing will be cleaned to prevent additional dispersal across the project area.

For aquatic services, all vessels, including but not limited to boats, canoes, kayaks, and inflatable float devices shall be thoroughly cleaned and dried prior to use in the project area. Cleaning will include the hull, bilge, live wells, and all boat-related equipment including but not limited to anchors, ropes, chains, oars, and trailers that will come in contact with any water body.

For boots, equipment and wading gear (except for felt-soled boots) visually inspect materials and scrub or pressure-wash all boots, equipment, and wading gear to remove all traces of mud, sand, and plant material.

For felt-soled boots, freeze overnight. If needed sooner, soak in hot water (>140°F) for at least 5 minutes or soak for at least 5 minutes in a solution of 1.2% sodium hypochlorite (20% solution of household bleach and 80% water). Rinse equipment to remove chemical residues after chemical treatments.

The County project manager or representative upon discovery of an unsatisfactory condition of aquatic equipment, vehicles, boots, or clothing may, at their discretion, require work stoppage and removal of offending items until the problem is remediated.

XVI. Fueling and Equipment Repair

No fuel, motor oil, hydraulic fluid, grease, or any other petroleum or chemically based compounds associated with operating motor vehicles or mechanized equipment shall be stored on site. These materials shall be transported to the site on an as-needed basis and contained on the bed of a truck or utility trailer. For any refueling that must be done over open ground, a spill pan or absorbent pad shall be placed below the fueling location.

All refueling or maintenance shall take place at least 25' from wetlands, wet prairie, intermittent stream channels, or open water. All used absorbent pads or spill pans must be removed from the site at the end of each day. Maintenance shall only occur within the staging areas designated by the County project manager. Equipment shall be inspected for any leakage of petroleum products. Excessive leakage shall be a basis for issuing an immediate shutdown of the operation.

XVII. Fire Protection Requirements

During the closed fire season, Contractor completing work tasks under this Contract shall adhere to all Oregon Forest Law (ORS) and Oregon Administrative Rules (OAR) for fire protection.

If a fire occurs, Contractor agrees to promptly report the fire to 911 and cooperate in the control and suppression of the fire.

- C. SPECIAL REQUIREMENTS. Contractor shall be solely responsible for and shall have control over the means, methods, techniques, sequences, and procedures of performing the work, subject to the plans and specifications under this Contract and shall be solely responsible for the errors and omissions of its employees, subcontractors, and agents.

Contractor has the skill and knowledge possessed by well-informed members of its industry, trade or profession and Contractor will apply that skill and knowledge with care and diligence and perform Services in a timely, professional, and workmanlike manner in accordance with standards applicable to Contractor's industry, trade or profession.

2. COMPENSATION

The total amount available for payment to Contractor under Exhibit A, section 2.A and for authorized reimbursement to Contractor under Exhibit A, section 2.C is **\$790,000.00**.

- A. METHOD OF PAYMENT FOR SERVICES: County shall pay Contractor rates specified in Attachment 1 but not in excess of total compensation amount.
- B. BASIS OF PAYMENT FOR SERVICES. County shall pay Contractor all amounts due for Services completed and accepted by County and for Goods delivered and accepted by County at the tentative milestones in Attachment 1 after County's approval of Contractor's invoice to County for those Services and Goods.
- C. EXPENSE REIMBURSEMENT. County shall reimburse Contractor for the cost of all documented disposal fees resulting from work that has been pre-approved by County, but not to exceed total compensation.
- D. GENERAL PAYMENT PROVISIONS. Notwithstanding any other payment provision of this contract, failure of the Contractor to submit required reports when due, or failure to perform or document the performance of contracted services, may result in withholding of payments under this contract. Such withholding of payment for cause shall begin thirty (30) days after written notice is given by the County to the Contractor, and shall continue until the Contractor submits required reports, performs required services or establishes, to the County's satisfaction, that such failure arose out of causes beyond the control, and without the fault or negligence of the Contractor.
- E. INVOICES. Contractor shall send all invoices to County's Contract Administrator at the address specified below or to any other address as County may indicate in writing to Contractor.

**Marion County Public Works
Attn: ES Parks Supervisor
5155 Silverton Rd NE
Salem, OR 97305**

Attachment 1 - Cost Proposal

Estimated costs to perform the listed services at each site shown in the table below.
Additionally, any hourly costs or per acre costs for non-listed services.

WORK TASK	UNIT	Price per Unit
Site prep labor (includes handpull, hand cutting, push mowing, installation of tree tubes, flagging, mulch application, and scalping)	HOURL	\$70
Planting labor (Bare-root and cutting stock)	PER PLANT	\$0.80
Plant purchase (Bare root and cutting stock 12-24")	PER PLANT	\$1.00
Mycorrhizal inoculation (of native bare-root and cutting stock)	EACH	\$0.06
Planting labor (1 Gallon Container Plants)	PER PLANT	\$4.00
Planting purchase (1 Gallon Container Plants)	PER PLANT	\$6.00
Project management	HOURL	\$125
Markup on plants/herbicide/supplies	PERCENTAGE	10%
Mobilization	EACH	300
Chemical application, includes backpack spot, ring, row, broadcast spray, as well as weedy tree chemical applications	HOURL	\$72
Disposal of materials	N/A	
Hydroseeding (does not include cost of seed)	ACRE	\$3900
Broadcast seeding (does not include cost of seed)	ACRE	\$250
Vegetative monitoring and survey	HOURL	\$125
Tree cutting	HOURL	\$100
Field flail or mow	HOURL	\$280
Drone monitoring	HOURL	\$100

Cost Control:

All estimates of billed hours are conservative and will not be exceeded. In many cases we anticipate completing work tasks under proposed hours and budget. Estimated hours have been scoped at the high end of what may be necessary. Estimated hours and costs have been developed after thorough site inspections of all relevant County project areas.

For the mitigation sites, ACFM already has past experience managing the work areas and has built this estimate from previous years' budgets and schedules. The mitigation budget and schedule proposed here reflect the rising cost of labor and materials, while taking into consideration the ongoing progress and predicted future needs at each site.

Santiam Canyon Parks Work Plan, Schedule, and Cost:

Year 1, January 2023-December 2024:

Date	Task	Number	Unit	Unit Cost	Total Cost	Notes
Jan-February 2023	Manual and Mechanical Weed Removal	315	Hours	70.00	\$22,050	Handpulling and Handcutting of non-native plants and EDRR species. Site Prep for first year planting.
February-March 2023	Tree and Shrub Planting	123,000	ea	0.80	\$98,400	Installation of native bare root plants and native cuttings
February-March 2023	Mycorhizal Innoculation	123,000	ea	0.06	\$7,380	PNW regionally sourced AMF and EMF spore inoculum
February-March 2023	Predicted Associated Hours-2023 planting	1,100	Hours			
Apr-23	EDRR Survey	35	Hours	125.00	\$4,375	Wandering EDRR surveys will be conducted across Marion Co park properties annually in late April, providing opportunity to perform removal treatments before seed set. Ongoing survey work overtime will also help inform adaptive management strategies.
April-June 2023	Herbicide Spot Spray	600	Hours	72.00	\$43,200	Selective spot spray non-native and EDRR plants species
April-June 2023	Materials	1	LS	3,000.00	\$3,000	Cost of purchase + 10%, associated with Spring spray work
Jun-23	Planting Monitoring	75	Hours	125.00	\$9,375	Fixed monitoring plots will be established across all project sites to quantifiably track survival, growth and vigor of installed native plants. Results of monitoring and EDRR surveys will be combined in an annual report to be submitted to the county.
Ongoing	Maintenance Labor	380	Hours	70.00	\$26,600	Flexible contingency hours to be used for weed treatment and plant maintenance either chemical, manual or mechanical, to be used as needed.
Aug-Sept 2023	Hyrdoseeding	15	Acres	3,900.00	\$58,500	Includes cost of tacifier, mulch and any other non-seed costs
Sept-October 2023	Handseed	105.4	Acres	250.00	\$26,350	Broadcast seeding using bellycrank seeders
Sept-October 2023	Predicted Associated Hours-Handseeding	450	Hours			
Sept-October 2023	Planting Monitoring	20	Hours	125.00	\$2,500	Qualative photo monitoring of planting plots to asses survival of installed plantings at the end of the dry season. Results of EDRR surveys, quantitative and qualatative monitoring from April-September 2023 would be compiled in a report to be submitted to the county at the end of September.
October-November 2023	Herbicide Spot Spray	400	Hours	72.00	\$28,800	Selective spot spray of non-native and EDRR plants species
Ongoing	Materials	1	LS	2,000.00	\$2,000	Estimated cost of herbicide +10%.
October-November 2023	Maintenance Labor	150	Hours	70.00	\$10,500	Combination of handpull, spray, cut stump, and mechanical weed treatments across all sites.
Ongoing	Mobilization	65	LS	300.00	\$19,500	Mobilization of crew and equipment from Tigard, OR
Ongoing	Project Management	125	Hours	125.00	\$15,625	Project coordination, site visits, scheduling, phone calls, plant procurement, etc.
Total Hours:		3,505		Total Cost:	\$378,155.00	

Year 2, January 2024-December 2024:

Date	Task	Number	Unit	Unit Cost	Total Cost	Notes
February-March 2024	Tree and Shrub Planting	200,000	ea	0.80	\$160,000	Installation of native bare root plants and native cuttings
February-March 2024	Mycorrhizal Inoculation	200,000	ea	0.06	\$12,000	PNW regionally sourced AMF and EMF spore inoculum
February-March 2024	Predicted Associated Hours-2024 Planting	1,850			\$0	
Apr-23	EDRR Survey	35	Hours	125.00	\$4,375	Wandering EDRR surveys will be conducted across Marion Co park properties annually in late April, providing opportunity to perform removal treatments before seed set. Ongoing survey work overtime will also help inform adaptive management strategies.
April-June 2024	Herbicide Spot Spray	450	Hours	72.00	\$32,400	Selective spot spray of non-native and EDRR plants species
April-August 2024	Maintenance Labor	150	Hours	70.00	\$10,500	Combination of handpull, spray, cut stump, and mechanical weed treatments across all sites.
Ongoing	Materials	1	LS	2,000.00	\$2,000	Estimated Cost of Herbicide +10%
Jun-24	Planting Monitoring	75	Hours	125.00	\$9,375	Fixed monitoring plots will be established across all project sites to quantifiably track survival, growth and vigor of installed native plants. Results of monitoring and EDRR surveys will be combined in an annual report to be submitted to the county.
Sep-24	Planting Monitoring	25	Hours	125.00	\$3,125	Qualative photo monitoring of planting plots to asses survival of installed plantings at the end of the dry season. Results of EDRR surveys, quantitative and qualatative monitoring from April-September 2024 would be compiled in a report to be submitted to the county at the end of September.
Oct-November 2024	Herbicide Spot Spray	350	Hours	72.00	\$25,200	Selective spot spray non-native and EDRR plants species
Oct-November 2024	Maintenance Labor	150	Hours	72.00	\$10,800	Combination of handpull, spray, cut stump, and mechanical weed treatments across all 8 sites.
Ongoing	Materials	1	LS	1,750.00	\$1,750	Estimated Cost of herbicide purchase + 10%
Ongoing	Project Management	100	Hours	125.00	\$12,500	Project coordination, site visits, scheduling, phone calls, plant procurement, etc.
Ongoing	Mobilization	80	LS	300.00	\$24,000	Mobilization of crew and equipment from Tigard, OR
Total Hours:		3,085		Total Cost:	\$308,025.00	

Year 3, January 2025-December 2025:

Date	Task	Number	Unit	Unit Cost	Total Cost	Notes
Apr-25	EDRR Survey	25	Hours	125.00	\$3,125	Qualative photo monitoring of planting plots to asses survival of installed plantings at the end of the dry season. Results of EDRR surveys, quantitative and qualatative monitoring from April-September 2024 would be compiled in a report to be submitted to the county at the end of September.
April-June 2025	Herbicide Spot Spray	350	Hours	72.00	\$25,200	Selective spot spray of non-native and EDRR plants species
April-August 2025	Maintenance Labor	200	Hours	70.00	\$14,000	Combination of handpull, cutting, cut stump, and mechanical weed treatments across all sites.
Ongoing	Materials	1	LS	2,000.00	\$2,000	Estimated Cost of Herbicide +10%
Jun-25	Planting Monitoring	75	Hours	125.00	\$9,375	Fixed monitoring plots will be established across all project sites to quantifiably track survival, growth and vigor of installed native plants. Results of monitoring and EDRR surveys will be combined in an annual report to be submitted to the county.
Oct-November 2025	Herbicide Spot Spray	350	Hours	72.00	\$25,200	Selective spot spray non-native and EDRR plants species
Sep-25	Planting Monitoring	25	Hours	125.00	\$3,125	Qualative photo monitoring of planting plots to asses survival of installed plantings at the end of the dry season. Results of EDRR surveys, quantitative and qualatative monitoring from April-September 2025 would be compiled in a report to be submitted to the county at the end of September.
Ongoing	Materials	1	LS	1,500.00	\$1,500	Estimated Cost of Herbicide +10%
Ongoing	Project Management	80	Hours	125.00	\$10,000	Project coordination, site visits, scheduling, phone calls, plant procurement, etc.
Ongoing	Mobilization	20	LS	300.00	\$6,000	Mobilization of crew and equipment from Tigard, OR
Total Hours:		1,080		Total Cost:	\$99,525.00	

Santiam Canyon ROW Work Plan, Schedule and Cost:

Date	Task	Number	Unit	Unit Cost	Total Cost	Notes
April-June 2023	Spot Spray-ROW	800	Hours	72.00	\$57,600	Annual Spot Spray of annual and perennial invasives along ROW property.
Ongoing	Materials	1	LS	2,000.00	\$2,000	Estimated cost of herbicide +10%
Oct-23	Broadcast Seeding	30	Acres	250.00	\$7,500	Hand Crank seeding of native grasses, does not include cost of seed. Seeding will minimize erosion and compete against encroaching invasives. Seeding areas would be scoped to cover areas most likely to have erosion concerns.
	Predicted Associated Hours-Handseeding	100	Hours			
February-March 2024	Shrub Planting	20,000	ea	1.25	\$25,000	Shrub planting in selected areas along road sides, scoped at 6x6 spacing. Shrub planting would decrease road run-off, minimize erosion, and mitigate encroachment of invasive seed from road.
	Predicted Associated Hours	385	Hours			
April-June 2024	Spot Spray-ROW	800	Hours	72.00	\$57,600	Annual Spot Spray of annual and perennial invasives along ROW property.
Ongoing	Materials	1	LS	2,000.00	\$2,000	Estimated cost of herbicide +10%
Ongoing	Mobilization	28	ea	300.00	\$8,400	Mobilization of crew and equipment
Ongoing	Project Management	30	Hours	125.00	\$3,750	Project coordination, site visits, scheduling, phone calls, plant procurement, etc.
	Total Hours:	2,085		Total:	\$163,850.00	

Mitigation Sites Work Plan, Schedule, and Cost:

Year 1, January 2023-December 2024:

Date	Task	Number	Unit	Cost/unit	Total Cost	Notes
Spring 2023	Maintenance labor	140	hr	\$70.00	\$9,800.00	Combination of handpull, spray, cut stump, and mechanical weed treatments across all 8 sites.
Summer 2023	Maintenance labor	120	hr	\$70.00	\$8,400.00	Combination of handpull, spray, cut stump, and mechanical weed treatments across all 8 sites.
Fall 2023	Maintenance labor	120	hr	\$70.00	\$8,400.00	Combination of handpull, spray, cut stump, and mechanical weed treatments across all 8 sites.
Winter 2023/2024	Planting: container planting purchase	500	ea	\$5.00	\$2,500.00	Purchase cost of desired native shrubs and trees.
Winter 2023/2024	Planting: container planting install	500	ea	\$4.00	\$2,000.00	Installation of desired native shrubs and trees.
Ongoing	Mobilization	13	ea	\$300.00	\$3,900.00	Mobilization costs per day.
Ongoing	Materials	1	LS	\$1,000.00	\$1,000.00	Estimated cost of herbicide.
Summer 2024	Professional Services	96	hr	\$125.00	\$12,000.00	Mitigation site monitoring and reporting.
Ongoing	Project Management	12	hr	\$125.00	\$1,500.00	Professional services including plant orders, extra site visits, and client communication and coordination.
				Total:	\$49,500.00	

Year 2, January 2024-December 2024:

Date	Task	Number	Unit	Cost/unit	Total Cost	Notes
Spring 2024	Maintenance labor	140	hr	\$70.00	\$9,800.00	Combination of handpull, spray, cut stump, and mechanical weed treatments across all 8 sites.
Summer 2024	Maintenance labor	120	hr	\$70.00	\$8,400.00	Combination of handpull, spray, cut stump, and mechanical weed treatments across all 8 sites.
Fall 2024	Maintenance labor	120	hr	\$70.00	\$8,400.00	Combination of handpull, spray, cut stump, and mechanical weed treatments across all 8 sites.
Winter 2024/2025	Planting: container planting purchase	450	ea	\$5.00	\$2,250.00	Purchase cost of desired native shrubs and trees.
Winter 2024/2025	Planting: container planting install	450	ea	\$4.00	\$1,800.00	Installation of desired native shrubs and trees.
Ongoing	Mobilization	13	ea	\$300.00	\$3,900.00	Mobilization costs per day.
Ongoing	Materials	1	LS	\$1,000.00	\$1,000.00	Estimated cost of herbicide.
Summer 2025	Professional Services	96	hr	\$125.00	\$12,000.00	Mitigation site monitoring and reporting.
Ongoing	Project Management	12	hr	\$125.00	\$1,500.00	Professional services including plant orders, extra site visits, and client communication and coordination.
				Total:	\$49,050.00	

Year 3, January 2025-December 2025:

Date	Task	Number	Unit	Cost/unit	Total Cost	Notes
Spring 2025	Maintenance labor	140	hr	\$70.00	\$9,800.00	Combination of handpull, spray, cut stump, and mechanical weed treatments across all 8 sites.
Summer 2025	Maintenance labor	100	hr	\$70.00	\$7,000.00	Combination of handpull, spray, cut stump, and mechanical weed treatments across all 8 sites.
Fall 2025	Maintenance labor	120	hr	\$70.00	\$8,400.00	Combination of handpull, spray, cut stump, and mechanical weed treatments across all 8 sites.
Winter 2025	Planting: container planting purchase	425	ea	\$5.00	\$2,125.00	Purchase cost of desired native shrubs and trees.
Winter 2025	Planting: container planting install	425	ea	\$4.00	\$1,700.00	Installation of desired native shrubs and trees.
Ongoing	Mobilization	13	ea	\$300.00	\$3,900.00	Mobilization costs per day.
Ongoing	Materials	1	LS	\$1,000.00	\$1,000.00	Estimated cost of herbicide.
Ongoing	Project Management	12	hr	\$125.00	\$1,500.00	Professional services including plant orders, extra site visits, and client communication and coordination.
				Total:	\$35,425.00	

**This scope of work/budget does not include purchase of native plant material on the assumption that these materials would be purchased by the County.*

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PERSPECTIVES

The Rapid Riparian Revegetation Approach

Peter Guillozet, Kendra Smith and Kathleen Guillozet

ABSTRACT

Loss of native riparian vegetation and dominance of invasive species can have negative consequences for river and floodplain dynamics, trophic interactions, water quality, and riparian systems' ability to buffer some of the impacts of climate change. In response, restoration and enhancement efforts have increased in scope and scale in recent years, despite the fact that there is limited information on the effectiveness of techniques. This paper describes one approach to riparian restoration and enhancement, termed Rapid Riparian Revegetation (R3), which promotes rapid cover of woody plants in a composition designed to mimic reference site conditions. Limited peer-to-peer learning opportunities and the significant investment in time and resources required to document practices, monitor outcomes and disseminate findings hampers practitioners' ability to both systematically improve ecological restoration practices and to share lessons learned with broader audiences. This paper seeks to narrow this gap by describing in detail riparian revegetation project planning, management actions, and costs incurred within typical grant funded projects. Initial planting densities prescribed in this approach are typically in the range of 5,400 to 6,400 stems per hectare (approx. 2,200 to 2,600 per acre), with inter-planting in the second year at 1,300 to 1,600 stems per hectare (approx. 530 to 650 per acre). Most sites are established over six to seven years at a total cost of \$11,000 to \$20,000 per hectare (approx. \$4,500 to \$8,100 per acre). This approach evolved in and is tailored to Oregon's Willamette Basin, but principles and practices are applicable to other regions.

Keywords: Pacific Northwest, reforestation, restoration

The divide between restoration practice and science is frequently mentioned in the literature as a cause for concern (Lave 2009, Lave et al. 2010) and as a contributing factor to failure and inefficiency in restoration efforts (Wyborn et al. 2012). At the same time, evidence suggests that some local projects are in fact successful, indicating that practitioners possess insights that might be documented, studied, and replicated (Hobbs 2006, Reid et al. 2011). Obstacles to the integration of restoration science and practice include a "lack of collaboration, poor communication, inappropriate funding and political timelines, change inertia, and a lack of capacity" (Burbidge et al. 2011, p. 54). Restoration ecologists place significant emphasis on the need for improved monitoring and post-project appraisal (Kondolf 1995, Downs and Kondolf 2002), but we also recognize that restoration has largely relied upon the application of "ad-hoc methods" (Hobbs and Norton 1996), which are seldom described in project records (Bernhardt et al. 2005). From a practitioner standpoint, this gap is equally critical to the assessment of restoration efficacy in terms of improving future practice. Here we support the need for increased informa-

tion sharing between and among practitioners and wider audiences (Seavy et al. 2009), with particular attention to the documentation of practice.

Since 2000, some riparian restoration in Oregon's Willamette Basin has been implemented through an adaptive approach, termed Rapid Riparian Revegetation (R3), developed by restoration practitioners, contractors, and government staff in the Portland Metro region. This approach is geared towards the rapid establishment of diverse, resilient riparian forests, and has been applied to degraded and converted valley floor and foothill forestlands in urban, rural, and agricultural areas. Common site characteristics include high levels of invasive weed cover, significant anthropogenic influences on riparian systems, and fragmented and constricted riparian plant communities.

We provide a detailed description of the R3 approach, which is designed to increase the scope, scale, and effectiveness of riparian restoration by: 1) promoting the rapid transition of degraded riparian areas to those characterized by high diversity and function; and by 2) lowering the unit cost of revegetation through greater efficiency in implementation.

Background

Western Oregon's Willamette River Basin is home to over 33,750 kilometers of perennial streams and rivers and over 70 percent of the state's human population (Hulse et al. 2002, USGS 2012). Oregon's Department of Environmental Quality (DEQ) estimates that about 38,850 hectares, or 1.3 percent, of the Willamette Basin's land area currently requires restoration to protect water quality (Michie 2010). The Pacific coast has the largest concentration of river restoration projects in North America, driven by funding for habitat improvements to protect and enhance anadromous salmon populations (Bernhardt et al. 2005). The region's population is projected to nearly double by 2050, from 2 million to 3.9 million residents, leading to further extensive and intensive land uses that will likely increase the need for restoration (Hulse et al. 2002).

Decades of riparian planting projects in the Pacific Northwest have used practices drawn from the field of landscaping or from prescribed revegetation protocols such as those used in the Conservation Reserve Enhancement Program (CREP), in which plants, typically trees, are planted in wide spacing arrangements and maintained with plant tubing, mowing, herbicide application and irrigation until establishment. In the authors' experience, this approach, applied to sites with urban or agricultural soil disturbance and extensive competition from introduced species, rarely yields the diverse multilayer canopies and understory plant communities typical of healthy forests, and can create ideal conditions for colonization by invasive species.

We distinguish between practices grounded in a "landscaping" approach, and those that characterize the R3 approach, which is grounded in forestry and ecology. The "landscaping" approach was the predominant approach used in Willamette Basin throughout the 1990's and early 2000's, and examples range from small-scale voluntary riparian planting efforts to mitigation projects, to sites enrolled in riparian re-conversion programs such as CREP. Field evidence and programmatic assessments pointing to repeated revegetation failures (Anderson and Graziano 2002), and an expanding regulatory nexus with riparian shading as a water quality compliance tool for temperature management (Clean Water Services 2005), signaled the need for new approaches.

Theoretical Basis for R3 Approach

One obstacle to the advancement of restoration is that practitioners often fail to apply or develop general theories or principles that in turn facilitate knowledge transfer across locations and contexts (Hobbs and Norton 1996). In an effort to counter this tendency, and in order to stimulate further discussion regarding the R3 approach, we articulate the key ecological concepts that guided its development.

Degraded Riparian Forests as Alternate Stable States

Riparian forests are as spatially dynamic as the streams and rivers they border. Natural disturbance regimes shape species reproduction strategies and plant community composition, but edge effects, loss of linear connectivity, habitat homogeneity (Sudduth et al. 2011) and invasive species dominance (Fierke and Kauffman 2006) can constrain historic pathways of system recovery. In recognition of the need to address fundamental causes of ecosystem degradation, restoration ecologists have proposed a shift towards process-based restoration that "allows the system to respond to future perturbations through natural physical and biological adjustments, enabling riverine ecosystems to evolve and continue to function in response to shifting system drivers . . . [in contrast to] engineered solutions that create artificial and unnaturally static habitats" (Beechie et al. 2010, pp. 209–210). However, changes in biogeochemical cycling, shifts in trophic interactions, landscape discontinuity, and loss of native seed sources can cause plant communities to persist in degraded "alternate stable states" indefinitely (Suding et al. 2004).

While process-based strategies that remove fundamental barriers to natural regeneration are preferred and achievable in some contexts, we suggest there are also strong arguments in favor of active intervention to counter riparian degradation. Namely, the lack of financial, social, and political will to address root causes of system degradation (Lackey 2000), the reality that many degraded systems represent "resilient alternative states" that resist process-based restoration (Suding et al. 2004, p. 50), the spatial limits to seed dispersal, and temporal limits to seed viability that make active revegetation necessary in order to retain local genetic diversity (Broadhurst et al. 2008).

r/K Selection Analogy

The ecological concept of r/K-selection (MacArthur and Wilson 1967) provides a useful analogy in contrasting R3 with other approaches to revegetation, with *r* representing the use of large numbers of small, bare-root plants established without plant tubes, mulch or irrigation (i.e., a reproductive strategy yielding a large number of offspring with limited individual parental investment), and with *K* representing the reliance on relatively few, large plants typically maintained with tubes, mulch and irrigation (i.e., a strategy involving few, large offspring with high parental investment). Examples of the latter are found throughout the Pacific Northwest and elsewhere (for examples, see Anderson and Graziano 2002, Butler and Long 2005) and are characterized by planting densities below 2,000 stems per hectare (approx. 800 per acre) and plant composition often more reflective of species availability, perceived reliability, landowner preference, or economic value than ecological objectives. Maintenance prescriptions on such sites

often consist of periodic mowing for several years to prevent swamping by grasses, and projects are considered complete once funding ends or when plants no longer require irrigation. By contrast, the R3 approach aims to minimize the per-plant investment and to achieve rapid canopy cover through the use of relatively inexpensive bare-root seedlings installed in densities and compositions drawn from local reference sites as well as through efficient site layout and streamlined maintenance practices that are administered until site conditions meet a reference condition trajectory (typically 5–7 years from time of planting). The approach employs a high percentage of shrubs to establish ‘trans-successional’ assemblages that include the woody species expected to be present on site at all seral stages. Examples include common snowberry (*Symphoricarpos albus*), Pacific ninebark (*Physocarpus capitatus*), red Elderberry (*Sambucus racemosa*), red osier dogwood (*Cornus stolonifera*) and swamp rose (*Rosa pisocarpa*) among others, depending on site conditions.

The R3 Approach

R3 is an adaptive approach to the restoration or enhancement of tree and shrub dominated riparian plant communities. Elements described in this paper range from site assessment to planting and include observed limiting factors to riparian restoration success, as well as strategies devised to help address them (Table 1). While the focus of this paper is the restoration and enhancement of degraded riparian forests, we acknowledge the critical importance of non-woody plant dominated riparian plant communities, including fluvial marshes, sloughs, wet meadows, alkali meadows and off-channel ephemeral ponds (Weisberg et al. 2012), and do not intend to imply that riparian forests are appropriate or desired in all contexts.

Evaluation of Site Dynamics

The R3 approach draws on combinations of field observations, soil maps, wetland delineation data, topographic maps, and Laser Imaging Detection and Ranging (LiDAR) mapping of ground surface and site features (when available) to characterize site conditions. Flood events, prolonged periods of inundation or drought, groundwater interactions, sediment deposition and scour, lateral channel migration, herbivory, and other disturbance factors inform site layout and species selection. We use small seedlings (30–60 cm tall), which tend to have greater root to shoot ratios than larger nursery stock and are often better suited to riparian site conditions. Under the “landscaping” approach, site dynamics may also be considered but irrigation, soil amendments, plant stakes, tubing, and caging are often used to mitigate the risks and challenges posed by site conditions.

Reference Sites

Reference sites identified in existing riparian forests with low levels of human disturbance and indicators of intact ecological processes can serve to inform desired future conditions at revegetation sites. However, in the context of climate change, invasive species introductions, and rapid urbanization, reference sites may be unavailable or difficult to find. Modeling approaches such as the dynamic reference concept (Hiers et al. 2012) attempt to accommodate such factors, but their data requirements and complexity places them out of reach of most practitioners.

While species composition in riparian planting projects is often derived from the palette of plants known by a designer or practitioner to tolerate site conditions, R3 uses a “guiding image” approach *sensu* Palmer et al. (2005) that incorporates local reference site data on species diversity, stem densities, tree to shrub ratios, non-native or invasive cover, and site constraints to anchor planting plans in an ecological context. This process is supported by continual reference site observations with attention to various stages of succession. In most cases, R3 planting plans are informed by two or more reference sites located at similar elevations to the project site within the same Fifth Field Hydrologic Unit Code (Sounhein 2003). R3 reference sites typically consist of non-planted, early- and mid-seral forest stands with no more than 20 percent non-native species cover in the canopy and sub-canopy layers. However, late-seral reference sites also provide valuable information that informs site planning. Because many factors determine the health and likely resiliency of a given forest and its suitability as a reference site, we collect data from plots selected preferentially with consideration given to factors such as stand age, species dominance, ‘representativeness’, distance from the edge, signs of disturbance, apparent resistance to invasion by certain weeds, and species richness. Within plots we count all live woody stems taller than 0.3 meters (1 foot) and count multi-stem species as one stem per 0.09 square meters (1 square foot).

Although there is significant variability among habitat types and successional stages, observations of native riparian forests in western Oregon (Table 2, N = 16) reveal densities ranging from 3,600 to 30,600 woody stems per hectare (approx. 1,400 to 12,400 per acre) with compositions averaging 21 percent trees and 79 percent shrubs (Query 2001, P. Guillozet, unpub. data). This is consistent with historic records such as land survey data from the late 1800’s and early 1900’s that describe the riparian forests as dense stands of vegetation with early successional species along active channels (Christy and Alverson 2011).

Establishment of Project Boundaries

Existing and potential weed populations, poor management of adjacent lands, livestock impacts, and public uses can pose significant challenges to the establishment

Table 1. Selected revegetation project elements, common limiting factors and the R3 approach.

Project Element	Limiting Factor	R3 Approach
Site dynamics	Lack of attention to disturbance regimes and ecological boundary conditions. High flows can wash away large nursery stock, plant protectors and irrigation systems.	Conduct detailed evaluation of site conditions. Select flood resistant stock sizes and avoid using plant protectors and irrigation systems.
Reference site data	Sites planted and managed out of context often revert to degraded alternate stable states.	Use reference site data as a 'guiding image' in the context of site conditions and surrounding land uses.
Site boundary establishment	Irregular or illogical site boundaries can increase unit costs and lead to reduced forest resilience.	Establish defensible ecological or physical boundaries to reduce edge effects.
Site preparation	Large equipment can disrupt soils and eliminate existing native vegetation.	Protect existing native vegetation through targeted chainsaw clearing and backpack herbicide application.
Ground cover establishment	Bare ground allows colonization by broadleaf weeds; tall grasses harbor voles and compete with plantings.	Seed with small-stature native grasses to establish effective cover without swamping plantings.
Species diversity	Species lists are often divorced from local plant communities.	Develop species lists informed by reference site diversity.
Tree to shrub ratios	Lack of appropriate vegetation layers (i.e. structural diversity) can facilitate invasion by weeds.	Distinguish between trees, arborescent shrubs, small shrubs and thicket forming shrubs; base ratios on reference site data and key threats.
Planting approach	Phased planting (e.g., trees first, shrubs later) extends establishment time and increases costs.	Plant all species appropriate for site during the initial planting with appropriate spacing and ratios.
Planting density	Planting density is often drawn from forestry or climax community data.	Derive planting density from early- and mid-seral reference sites.
Plant mortality	Mortality among widely spaced plants creates large gaps; mortality of large planting stock can be costly.	Plant at reference densities to account for normal mortality; inter-plant to adjust composition and density.
Planting layout	Random layouts interfere with maintenance, while straight rows result in unnatural looking forests.	Plant in meandering rows to facilitate maintenance and create more natural looking forests.
Seed sourcing	Poor seed sourcing can introduce inappropriate species or genotypes.	Establish nursery contract(s) with designated seed collection areas.
Stock type selection	Nursery stock often have inappropriate root to shoot ratios.	Plant 1–2 year old bare-root seedlings grown to specifications.
Plant handling and installation	Planters lack familiarity with proper plant handling and installation techniques.	Establish detailed specifications for nurseries, cooler operators, and revegetation contractors.
Moisture conservation and irrigation	Moisture stress is a major cause of plant mortality; irrigation systems are costly, unreliable, water intensive, and they water weeds.	Employ early ring spray treatment to reduce competition from grasses.
Site use by wildlife	Wildlife can kill or damage a large percentage of planted trees and shrubs; protecting individual plants is costly and often ineffective.	Account for historic, current and anticipated wildlife use in species selection and layout; inter-plant with less palatable species.
Rodent damage control	Tubing and caging are costly, often produce plastic waste or float away and can be ineffective.	Employ ring spray treatment to prevent damage by voles and other rodents.
Vegetation monitoring	Monitoring methods often evaluate progress towards goals with no ecological basis.	Evaluate revegetation trajectories against ecologically based criteria derived from reference sites.

and long term resilience of restored riparian plant communities. While some pressures can be mitigated through careful attention to site hydrology, soils, topography, and weed and herbivory risks, we have observed that the size, shape, and degree of continuity of a project can have a profound influence on project outcomes. With the increasing prominence of riparian shading programs for regulatory compliance, the exclusion of portions of riparian areas due to political boundaries, low shade credit value,

landowner non-participation, or other reasons may have negative implications for the economic and social resiliency of revegetation programs. Moreover, narrow, convoluted, or discontinuous project boundaries represent missed opportunities that allow for the persistence of weed populations, reduce forest resilience, increase unit costs, and lower aesthetic values. R3 emphasizes the identification of project boundaries that eliminate unmanaged areas, increase connectivity, and minimize edge effects to the

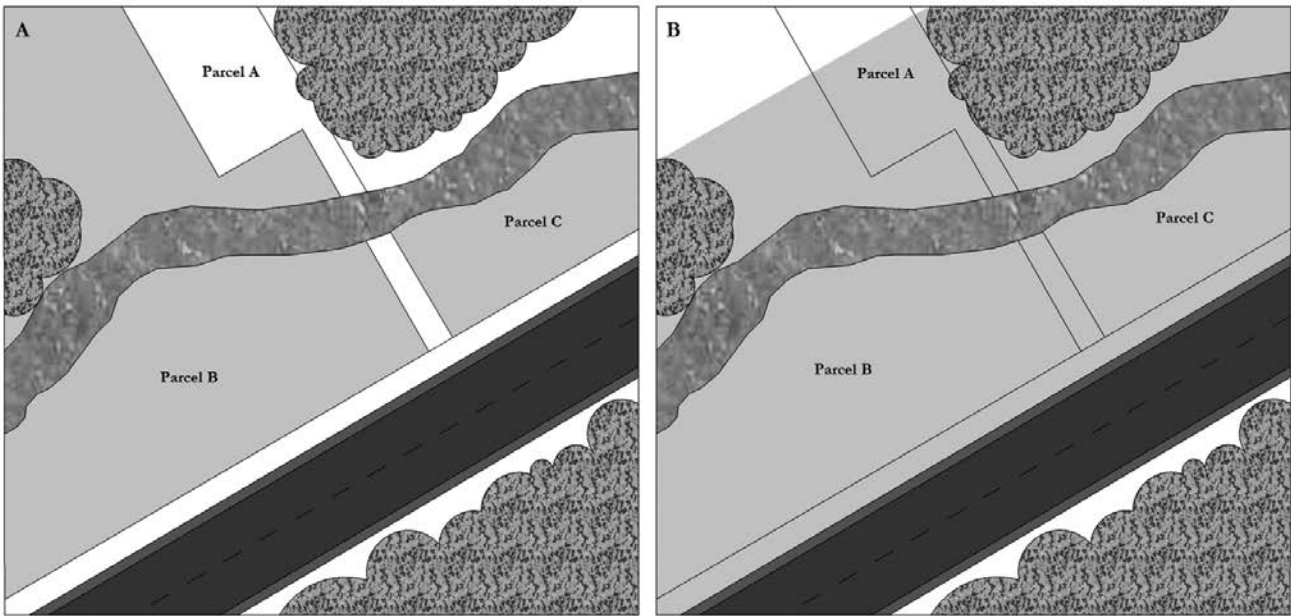


Figure 1. Equal-sized riparian revegetation project area scenarios (in gray). One project (A) is defined by parcel boundaries and ease of access while the other (B) has ‘defensible’ boundaries designed to maximize continuity and reduce unmanaged area and edge effects.

extent practicable by extending revegetation boundaries to the edge of the bankfull channel and to other natural or defensible boundaries on the floodplain terrace or adjacent uplands whenever possible (Figure 1). On many sites, we establish transitional shrub thickets along forest edges to reduce edge effects and re-invasion by shade intolerant weeds.

Site Preparation and Cover Establishment

Existing conditions guide the development of R3 site preparation plans, and primary consideration is given to strategies that reduce weed competition during initial years of establishment. After experimenting with disking equipment as a means of preparing areas for planting, we found that access was often impractical and that it exacerbated weed conditions. We therefore consider soil disturbance undesirable except where soils have been severely compacted or altered. Depending on the extent

Table 2. Sample reference site summary data from selected sites Western Oregon (Portland sites adapted from Query 2001, others from Guillozet, unpublished data).

General location	Forest type	Trees/ha	Shrubs/ha	Total stems/ha	Est. stand age
Portland	Ash floodplain	544	30,117	30,660	70
Buena Vista	Cottonwood/maple floodplain	240	5,552	5,792	100
Buena Vista	Ash/cottonwood floodplain	425	6,506	6,931	50
Portland	Cottonwood riparian	235	3,398	3,632	80
Buena Vista	Cottonwood riparian	524	4,784	5,308	80
Medford	Cottonwood riparian	1,977	10,872	12,849	80
Medford	Cottonwood riparian	2,718	3,212	5,930	10
Medford	Cottonwood riparian	4,942	6,919	11,861	10
Medford	Cottonwood riparian	5,189	1,236	6,425	40
Portland	Mixed conifer/hardwood rip.	237	20,368	20,606	150
Portland	Mixed conifer/hardwood rip.	642	11,861	12,503	90
Portland	Upland conifer	7,771	4,757	12,528	10
Portland	Upland conifer	7,277	7,413	14,690	10
Portland	Shrub-scrub wetland	0	25,886	25,886	6
Buena Vista	Shrub-scrub wetland	284	7,791	8,075	30
Portland	Forested wetland	408	7,944	8,352	20

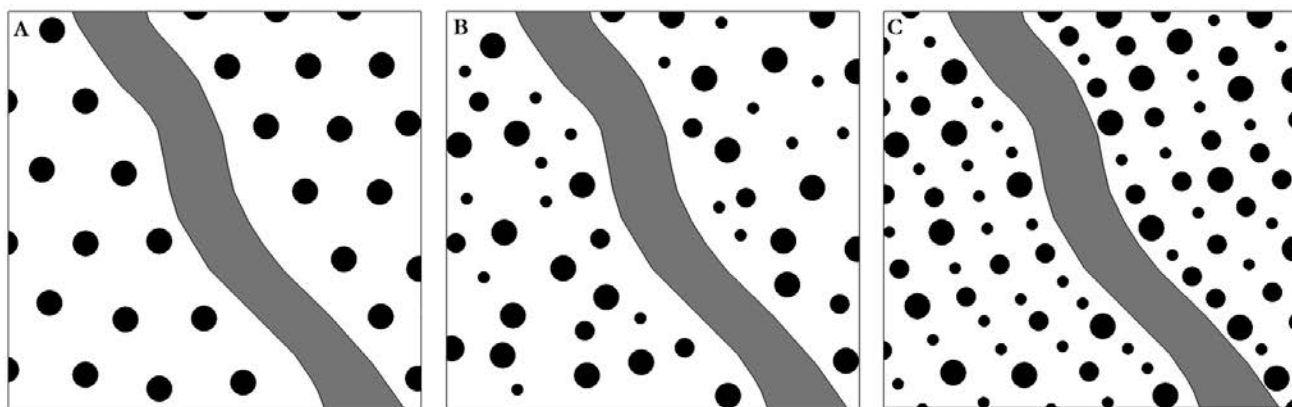


Figure 2. Low density trees on grid (A), random layout with 1:1 tree-shrub ratio (B), typical R3 layout in curved rows with 1:3 tree-shrub ratio (C).

and characteristics of existing weeds, effective site preparation typically includes mowing and brush clearing as well as spot or broadcast application of approved herbicides over a one- to two-year period. On sites with little or no native vegetation, flail mowing is the preferred method of brush removal, while experienced chainsaw crews provide an effective means of selective brush removal on both small and large sites. Following control and removal of undesired vegetation, we rely on seeding with a locally sourced two to three species mix of short-stature native grasses (e.g., *Agrostis exarata*, *Deschampsia elongata*, and *Deschampsia danthonioides*) to suppress weeds and reduce soil erosion while minimizing competition with planted seedlings. We spread seed at rates of 9 to 13 kilograms per hectare (roughly 8 to 12 pounds per acre) using belly crank or ATV spreaders on small sites and using no-till drilling on large sites. Equipment and operators for the latter are readily available in the Willamette Basin owing to its robust agricultural sector. Depending on the timing, site size, hydrology, soils, and weed conditions, seeding may be completed either before or after planting.

Planting Design

Although trees may provide most of the eventual shading, high shrub densities function as a matrix for soil protection, wildlife forage and cover and ground-level shading for weed control. A key lesson during the development of R3 was recognition of the importance of structural and functional differences among arborescent shrubs, small shrubs, and thicket-forming shrubs. In developing planting plans we derive the species list, the target stem densities, and the ratios among trees and shrub types from the reference sites. We then account for existing vegetation and assess soils, hydrology, weed pressures, wildlife use, and other obvious limiting factors. On bare sites, total planted stems typically range from 5,400 to 6,400 stems per hectare (roughly 2,200 to 2,600 per acre). Trees typically represent fewer than 20 percent of total stems and thicket-forming shrubs often represent 60 to 70 percent of total shrubs. The R3

approach also relies heavily on inter-planting, which allows managers to offset initial mortality and adjust species composition and densities in response to observed ecological conditions. It is our standard practice to budget for the purchase and installation of 25 percent of the initial planting numbers in the second year of a project (e.g., initial planting at 6,000 stems/hectare $\times$ 25% = inter-planting at 1,500 stems/hectare).

The primary objectives of R3 planting plans are consistency with reference plant community composition, development of a multi-strata canopy, competitive exclusion of non-native species, and reduction of edge effects. Although native forbs play an important role in forest ecology, aggressive weeds can make their reintroduction impractical in the early stages of many revegetation projects. The R3 approach instead emphasizes native grass establishment followed by multi-strata canopy development to reduce weed cover and create future conditions more favorable to native forbs.

Planting Spacing and Layout

Plant spacing in R3 is informed by reference site data and conditions in the planting area. Sites with severe weed problems or anticipated herbivory typically require more plants, while those with desirable herbaceous cover or with partial canopy cover are planted at lower densities. To eliminate the need for future thinning, our planting plans specify tree to shrub ratios that aim to establish appropriate spacing between large, slow growing and/or highly competition-sensitive trees such as Douglas fir (*Pseudotsuga menziesii*) and Oregon white oak (*Quercus garryana*). Planting layouts generally follow natural contours and take the form of meandering rows with regular row and plant spacing. Plant clustering by species or growth habit is achieved through repetition of rows or portions of rows (Figure 2). Depending on desired densities, row and plant spacing on bare ground typically range from 1 to 1.2 meters on center (approx. 3 to 4 feet). In addition to yielding more natural looking forests than straight rows

(Figure 2), this arrangement reduces costs by streamlining maintenance practices and increasing the visibility of small seedlings.

Plant Sourcing and Stock Types

Unavailability of appropriate (species, genotypes, stock type, and size) nursery stock is a common limiting factor in revegetation projects. R3 practitioners have devised a system of multi-year contract growing arrangements with multiple nurseries in the Willamette Basin to reduce risk and build local capacity. Collaborative agreements across organizations to collectively source plant materials, provide greater security to growers, increase flexibility, and reduce plant costs. Contract growing also gives buyers greater leverage to limit seed collection to recognized seed zones or other pre-determined areas (e.g., Willamette Basin below 450 meters elevation). While this provides some assurance that plant materials are adapted to local conditions, revised seed collection standards that take into account the implications of climate change, elevation and ecological barriers for plant genetics are currently under development (see WWETAC 2013) and will be incorporated into future contracts.

The target seedling concept, described by Rose et al. (1990), identifies specific physiological and morphological seedling characteristics and serves as a valuable tool in stock type selection. Although most research comparing root development among containerized and bare-root stock has focused on conifer species used in timber production, there is no clear consensus on the advantage of either in terms of survivability, placing into question the higher plant purchase, transport, and installation costs associated with containerized stock (Hobbs 1984, Grossnickle 2005). While container-grown seedlings may demonstrate greater initial survival in a number of trials on droughty sites (Arnott 1975, Hobbs and Wearstler 1983, Burdett et al. 1984, Nilsson and Örlander 1995), other studies suggest that growth differences between stock types are temporary (Rose and Haase 2005).

Although factors such as project scale, accessibility, planned site preparation and maintenance practices, and current and potential stock type availability will often point to a preferred stock type, most stock types can yield acceptable results across a range of conditions. However, the larger the nursery stock the higher the purchase, transport and planting costs (Landis et al. 2010, Withrow-Robinson et al. 2011). R3 relies almost exclusively on 1–0, 1–1 or similar bare-root seedlings 30 to 60 centimeters tall, and on vegetative cuttings, as both are readily available in the Willamette Basin (2013 average contract cost: \$0.48 per seedling, \$0.15 per cutting) and can be planted more efficiently in large numbers. These attributes enable managers to adjust species composition in response to mortality at a relatively low cost. In comparison, average 3.8-liter (1 gallon) containerized plants sourced from the

same nurseries costs an average of \$4.13 (2013 prices, for example see www.schollsvally.com).

Plant Handling and Installation

The bare-root planting season in the Willamette Basin typically extends from January through March, while containerized seedlings allow for fall, winter and spring planting. Although some planting stress is unavoidable under most planting conditions, severe stress is a major contributor to bare-root seedling mortality following outplanting (Grossnickle 2005). Planting stress can be minimized by planting seedlings properly and ensuring proper root-soil contact, which reduces seedling water stress and allows the seedling to initiate new root growth (Grossnickle 2005). It is critically important to protect bare-root seedlings at all times from freezing and drying during lifting, storage, transport and planting (Landis et al. 2010).

To prevent damage and loss, R3 nursery and plant storage contracts include detailed specifications for growing, packing and cooler storage. Once removed from the cooler, plants are kept covered at all times using reflective tarps and plant roots are wetted prior to planting. The sensitivity of bare-root stock underscores the R3 approach's reliance on qualified project managers and skilled planters who are familiar with planting in riparian areas. A skilled planter is familiar with the moisture, light, and soil requirements of different species and can plant 800–1,000 bare-root plants per day at an average cost of \$0.28 per plant. Project managers provide quality control over planting activities by inspecting periodically for proper placement, spacing, planting depth, root arrangement, and soil tamping.

Site Maintenance

Frequent site visits throughout the growing season and effective manual, mechanical, and herbicide maintenance practices are among the most important factors in successful R3 projects. Such visits can reveal excessive competition from surrounding vegetation, moisture stress, and signs of herbivory early enough to allow for corrective measures. Following site preparation and planting, vegetation management typically includes either mowing, cutting, spot herbicide treatments, or a combination of these activities. On R3 projects, mowing has proved problematic, as the size of mowing equipment dictates row spacing that is often wider than desired. Moreover, mowing can lead to soil compaction and, because of potential impacts to ground nesting birds, is restricted by various agencies during the spring and early summer. In Oregon, these mowing restrictions coincide with the critical period for weed control. Although targeted cutting of problem areas by chainsaw crews has been used extensively and has proven effective, it is relatively expensive, and like mowing, can disrupt ground nesting birds. The combination of small-stature native grass cover and periodic spot herbicide has provided the most effective alternative to cutting or mowing. Specifically, a

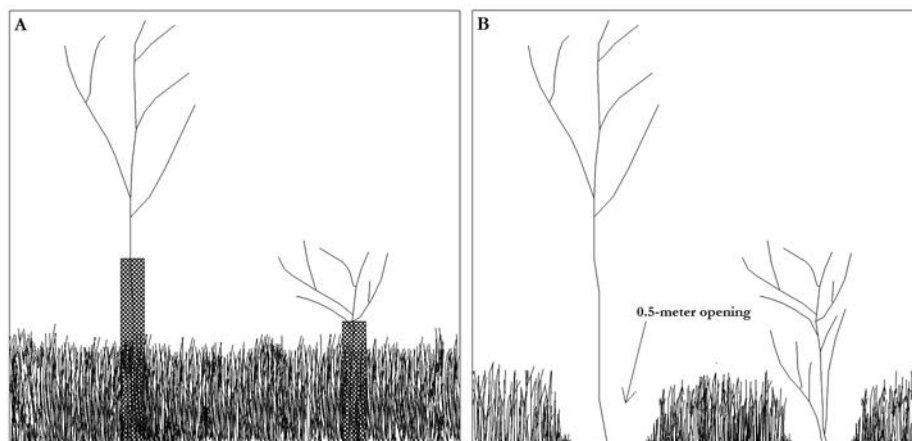


Figure 3. Plastic tubing on trees and shrubs surrounded by tall grasses (A), which often results in moisture stress and rodent damage. Preferred R3 conditions (B) with short-stature native grass cover and early season grass control 'ring' spray, which conserves moisture and prevents plant girdling by rodents.

moisture conserving ring spray around each plant in the spring or early summer reduces competition from grasses (Figure 3) and creates openings around plants that expose rodents to predators such as raptors, owls, and coyote. This practice has essentially eliminated girdling damage on R3 projects and, along with spot spraying, has provided adequate control of target weeds.

Irrigation

In arid areas or during drought years, irrigation may reduce plant mortality. However, irrigation can be both impractical and costly on large or discontinuous projects. Irrigation systems are prone to breakdown, vandalism and damage during high flows, and plastic irrigation pipes are often left on sites permanently. In particularly arid areas or on dry soils mulching and hand-watering by crews with water tanks or pumps can provide a viable alternative to irrigation systems, but may be impractical due to high costs and water rights issues. In the Willamette Basin (mean June to September precipitation = 108 mm (NOAA 2013)), proper species selection and placement of appropriate nursery stock (e.g., small, bare-root stock with balanced root to shoot ratios) in combination with effective vegetation control around plants (e.g., ring sprays) have eliminated the need for irrigation on sites managed using the R3 approach since 2006. In the event of high plant mortality, inter-planting has been a more cost-effective strategy to offset losses.

Herbivory

Wildlife habitat enhancement is often a goal of riparian revegetation, but wildlife may also impact our efforts. Ungulate browse can deform trees and shrubs, reduce growth and increase mortality, while voles and other rodents can damage or kill plants through bark girdling (Weigand et al. 1993, Withrow-Robinson et al. 2011). In the Willamette Basin, the historic removal of beaver and current re-colonization trends pose both management challenges and opportunities. While beaver promote ecological processes and functions, vegetation must be sufficiently established to support stable beaver populations.

By assessing historic and current use by wildlife via frequent field visits, and by planning for future use, R3 seeks to address the needs and impacts of wildlife through appropriate plant selection and placement, high planting densities and effective maintenance practices. For example, at sites with extensive browsing pressure or with existing or potential beaver activity, certain species are overplanted in high traffic or near-stream areas to provide adequate food sources and dam-building materials and to reduce pressure on other vegetation during establishment. Other options to reduce browse include the use of less palatable species or a greater emphasis on establishing thicker-forming shrubs. While plant protection tubes and cages can be effective if installed properly and maintained in uplands, they are prone to improper installation, degradation, and loss or damage during high water events (Stanturf et al. 2004). Plant protectors are often found girdling growing trees and are increasingly found as trash along Willamette Basin streams (W. Hudson, Oregon Watershed Enhancement Board, pers. comm.)

Vegetation Monitoring

In evaluating revegetation treatments, an ecological perspective is often subordinate to the pressure to declare victory or conclude investigations while funds are available (Kondolf 1995, Producers et al. 2000). The use of percent survival to assess project success, as is common practice (see, for example, Smith 2012), may unintentionally incentivize project performance-based rather than ecologically-based management decisions because success is determined on the basis of the survival of an often arbitrary number of plants rather than on the achievement of ecological objectives such as shade establishment for water quality benefits or species and structural diversity for wildlife habitat and resilience against reinvasion by weeds. The R3 approach monitors vegetation trajectories independently of planting prescriptions through assessment of stem densities, tree to shrub ratios and non-native or invasive cover. Data from sample plots assigned at random within distinct plant communities are compared to project or programmatic

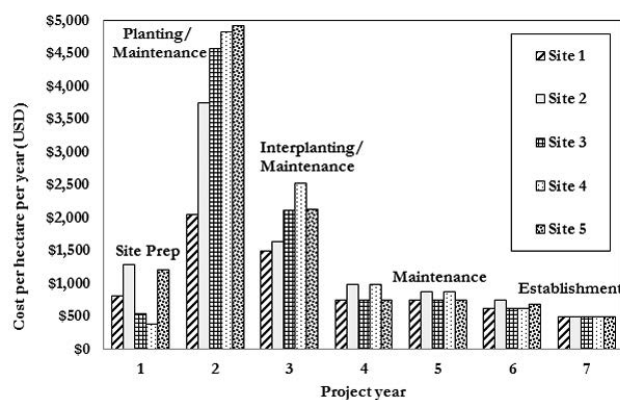


Figure 4. Projected cost (USD per hectare) through forest establishment on example R3 project sites near Buena Vista, Oregon.

revegetation targets informed by local reference sites. The size and number of plots varies and is based upon variability in the sample population (see Oregon Department of State Lands 2009).

Sample Projects

The R3 approach as described in this paper reflects current practices as refined over a decade in an ongoing process. As such, projects that began in 2003 are different in substantive ways from those begun in 2013. Examples of improvements include an increase in mean stem density, greater attention to the establishment of native grass cover, the near elimination of mowing as a maintenance practice, increased use of shrubs as a percentage of total stems, and increased use of thicket-forming shrubs as a percentage of total shrubs. To provide examples of recent R3 implementation we selected five representative revegetation sites within a single project in Oregon's Willamette Basin. The sites are currently in varying stages of completion and, therefore, reflect a mix of both actual and projected costs. Together, they encompass 51.3 hectares (126.8 acres) of moderately to highly degraded former riparian or floodplain forest, and represent a range of site conditions and goals typical of R3 projects. The project is funded through multiple grants to a non-profit organization that hired the first author and a revegetation contractor to implement restoration plans. Prior to the start of work, Site 1 was a degraded riparian forest with substantial invasive weed cover, particularly Himalayan blackberry (*Rubus armeniacus*). Site 2 had been planted at roughly three meters (10 feet) on center circa 2002 with tubed trees and shrubs through the CREP program. The site was mowed for several years and subsequently invaded by blackberry, reed canary grass (*Phalaris arundinacea*) and a host of common agricultural weeds. Site 3 was a wetland dominated by reed canary grass for many decades. Site 4 had been a farmed field until 2011, and Site 5 was originally planted circa 2002 using a CREP approach

and supported sparse native vegetation and extensive weed cover as of 2011.

Table 3 summarizes pre-implementation conditions, planting details, level of effort of different activities represented as a percentage of total cost, and the total cost per hectare. Total revegetation costs at these sites average \$11,000 per hectare over a seven year period. Figure 4 presents data from the same sites and illustrates project implementation timelines and cost trends typical of R3 projects. Although implementation costs vary according to project location and size, site conditions, project manager, contractor, and other factors, in the first author's experience, R3 costs in the Willamette Basin typically range from \$11,000 to \$20,000 per hectare (\$4,500 to \$8,100 per acre).

Conclusions

Riparian restoration project managers face a number of constraints in implementing revegetation projects. These include abbreviated field seasons, competing project needs, limited funding, short grant timelines, and poorly developed monitoring and evaluation criteria. Sharing and documenting information about effective practices can help practitioners and funders make informed decisions and increase the likelihood of success in the field. Peer-to-peer learning opportunities among project managers can foster a community-of-practice that can advance the science and practice of restoration.

This description of R3 is intended to encourage discussion and research on best practices for achieving desired future conditions as they relate to riparian revegetation, and we recognize that it may generate more questions than answers. Practitioners, regulators, and funders all play a role in advancing replicable approaches to restoring riparian corridors. Some priority areas for research and documentation from our perspective include:

1. Quantitative evaluation of existing R3 projects in comparison with other approaches used locally to evaluate outcomes and linkages between practices and ecological conditions (the second author will conduct an evaluation of Willamette Basin riparian revegetation projects in 2014).
2. Examination of reference site selection and data collection protocols to assess methodological rigor. In high-intensity restoration areas such as the Willamette Basin, historic botanical studies and contemporary data could be incorporated into a centralized database of reference sites to guide revegetation.
3. Application and possible modification of R3 approach for more arid environments and in areas lacking existing nursery and forestry contractor sectors.
4. Assessment of revegetation outcomes and costs in relation to the duration of site preparation, planting density and the intensity and duration of maintenance.

Table 3. Summary of example R3 sites near Buena Vista, Oregon highlighting pre- and post-project conditions, planting details, and projected total cost per hectare.

Site no.	Initial site condition	Desired future condition	Area (ha)	Previous stems/ha (mean)	Planted stems/ha (mean)	No. of species planted	Planted tree to shrub ratio	Percent of total cost						Total cost/ ha
								Project mgt.	Site prep	Planting & inter-planting	Bare root plants	Native seed	Maintenance	
1	Degraded riparian forest	Mixed riparian/gallery forest	2.6	4,448	1,977	14	1 to 4	17.6%	9.5%	7.5%	14.7%	2.3%	48.4%	\$8,420
2	Degraded CREP plantings (circa 2002)	Gallery forest	28.8	2,224	3,459	23	1 to 3.5	13.2%	11.4%	9.4%	18.5%	1.3%	46.2%	\$11,222
3	<i>Phalaris</i> dominated wetland	Shrub-scrub wetland	2.3	0	5,930	7	1 to 5	13.1%	4.8%	12.0%	31.6%	1.8%	36.7%	\$11,284
4	Farmed until 2011	Gallery forest	6.1	0	6,425	28	1 to 3.5	12.2%	3.0%	12.7%	30.5%	2.4%	39.1%	\$12,148
5	Degraded plantings (circa 2002)	Mixed riparian/gallery forest	11.5	988	5,436	26	1 to 4	12.0%	9.8%	12.7%	27.6%	1.6%	36.4%	\$12,383
Average			10.3	1532	4645	19.6		13.6%	7.7%	10.8%	24.6%	1.9%	41.4%	\$11,091

5. Comparative evaluation of rates of reinvasion by shade tolerant and shade intolerant weed species in revegetated areas with single and multi-story canopies.
6. Long term post-establishment monitoring of vegetation dynamics with attention to tree, shrub, grass, forb, and weed populations with and without ongoing stewardship.

With hundreds of thousands of kilometers of riparian corridors in need of restoration and limited public funds for implementation, practitioners need to identify strategies that lower the unit cost and accelerate the pace of reestablishment of native riparian forests in sustainable ways. The R3 approach is grounded in ecological principles and geared towards producing outcomes consistent with restoration programming and the human desire to see “progress” for the investments made. As such, the approach represents an attempt to bridge the best available science with practice. This underscores the authors’ interest in promoting dialog between academics and practitioners in order to encourage debate and structured inquiry about revegetation practices.

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