Production of Native Seed Ecotypes to Support Diverse Large-scale Conservation Efforts in California

Keynote Presentation for Northern California Botany Symposium

Pat Reynolds
13 January 2025

RIVER PARTNERS

Heritage Growers
is a venture of River Partners

HERITAGE GROWERS

Ii f \I EEO L T UP Y

30th Anniversary 1991 - 2021

California Native Grasslands Association

GRASSLANDS

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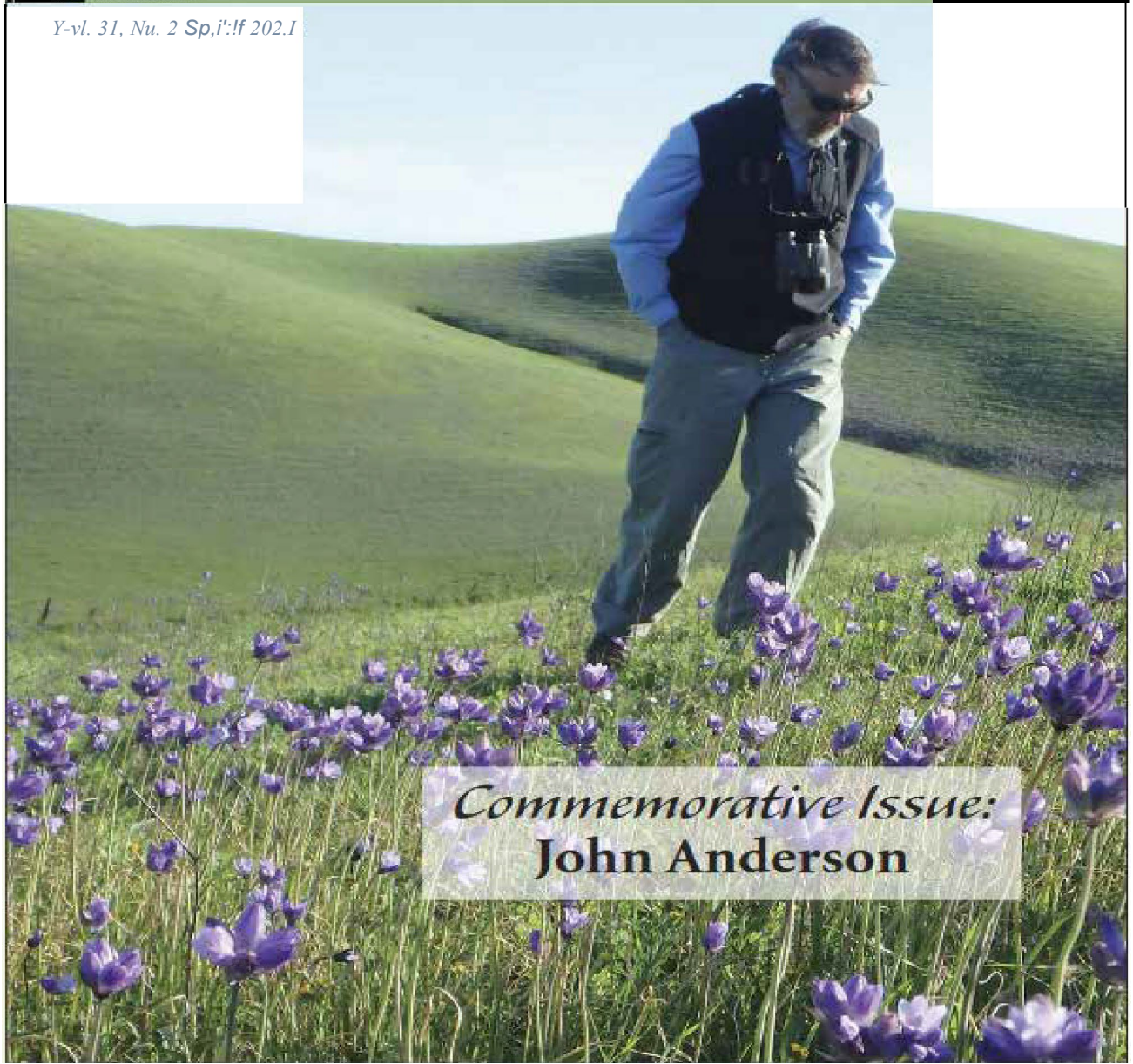

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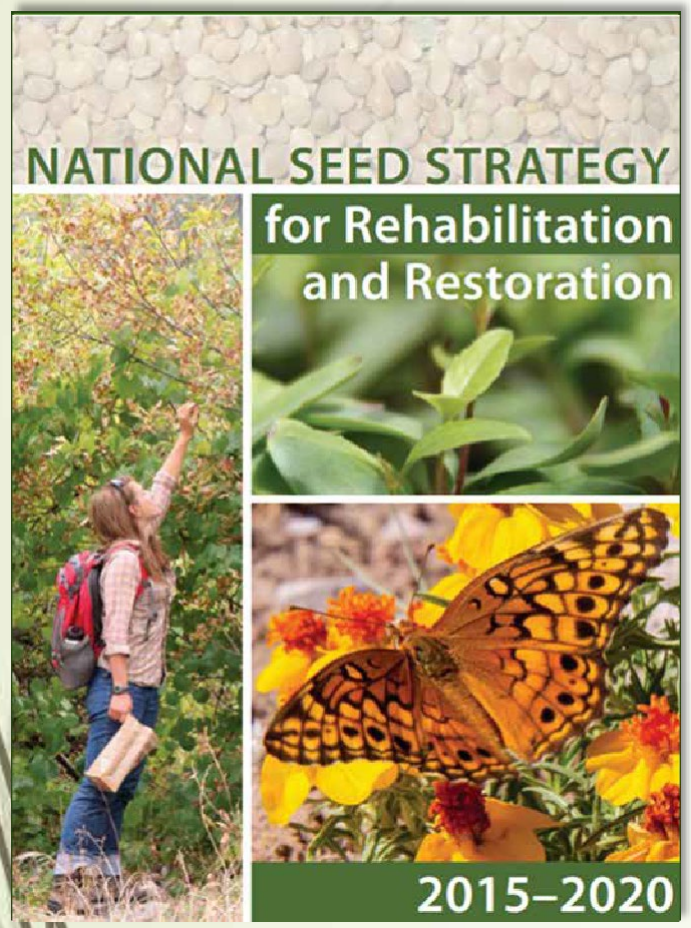
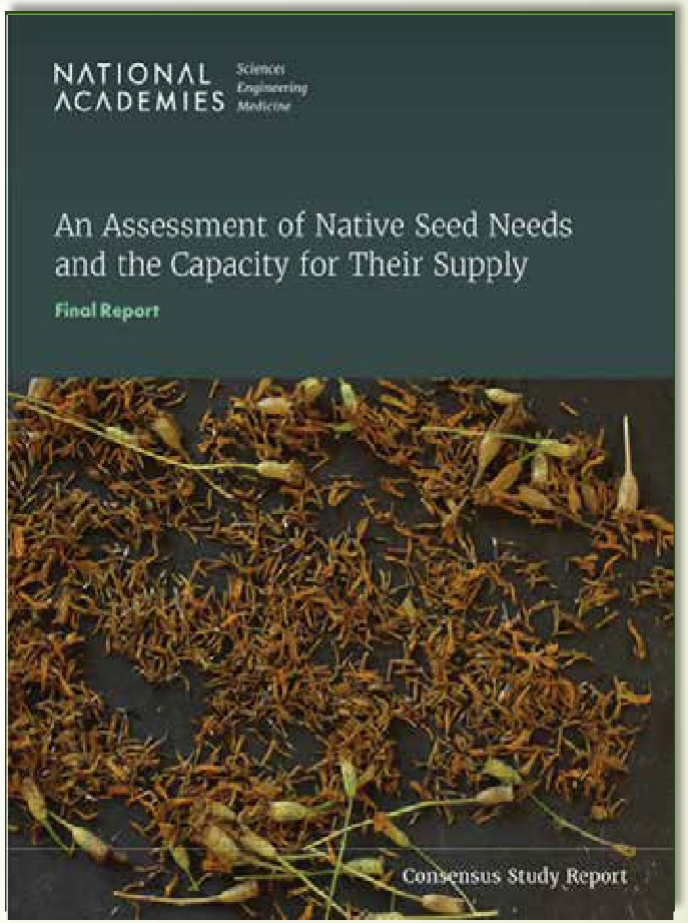
NATIVE SEED & PLANT SUPPLY

Source Identified Native Seed Bottleneck





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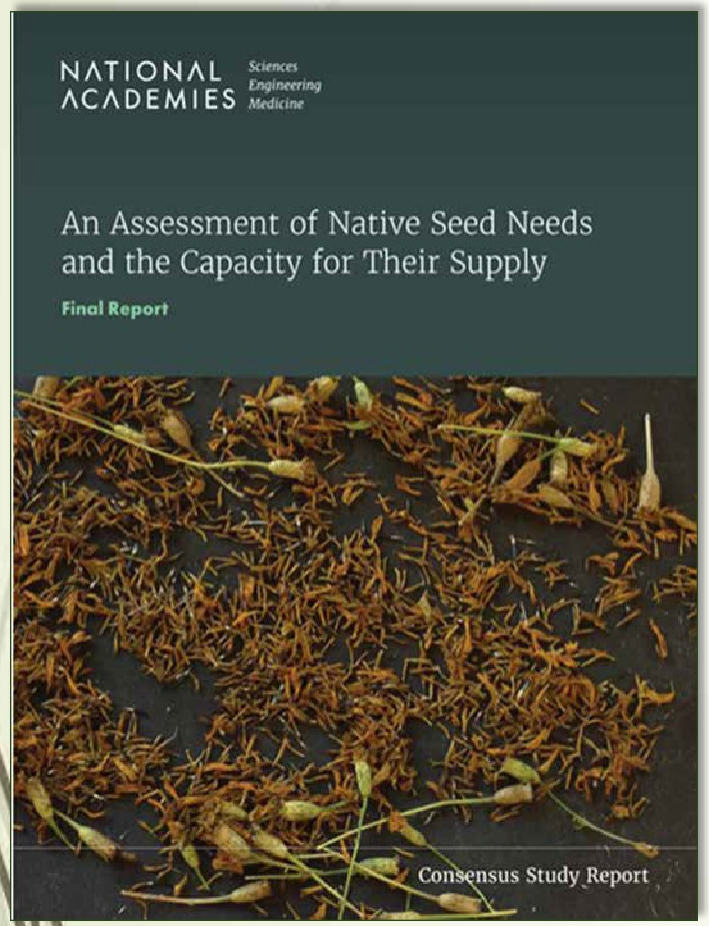
Status of Source Identified Native Seed



- Report Findings
  - Supply of Native Seed Insufficient to Meet Demand
  - Specialized Knowledge, Equipment and Substantial Capital Required to Produce
  - Volatile Demand Disincentives Production
  - Adequate Lead Time Needed to Produce Seed
  - Wildland Stock Seed a Significant Limitation
  - Technical Difficulties Growing Out New Species and Ecotypes

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NATIVE SEED & PLANT UP y

Media Coverage on Native Seed

Bay Nature

The Native Seed Gold Rush

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The Race to Save America One Seed at a Time

Restoring Publli, lands with homegrown seeds to btH1:st the Golden State's resilience

HIGH VALU E HABITAT: PAT REYNO LDS H ERITAGE GRO WERS N ATIV E SEED S & PLAN TS

Pat Reynolds is a rest oratio n e cologist wit h more than 30 years of profe ssiona l e xper ie nce in the design, im ple me ntat io n and mo nito ring...

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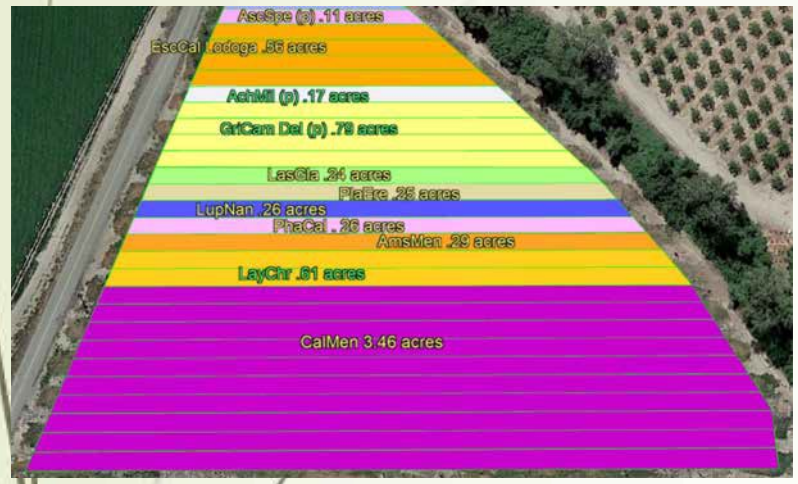
NATIVE SEED & PLANT SUPPLY

Source Identified Native Seed Amplification Process



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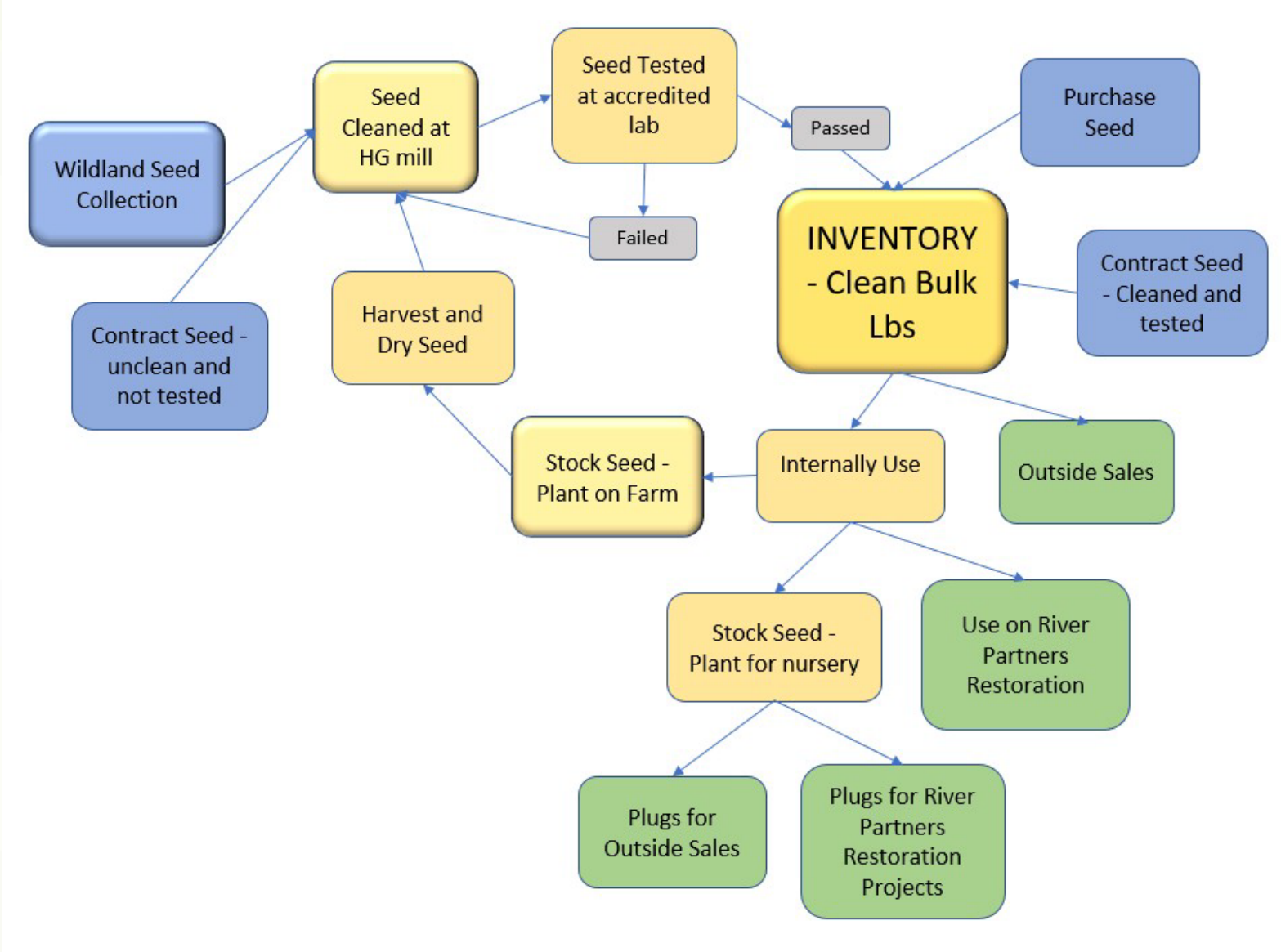
Inventory and Data Management

- Complex
- Numerous Details to Track
- Finding the Right System is Key
- Tied to Accounting System
- Non-Profit Accounting Increases Complexity



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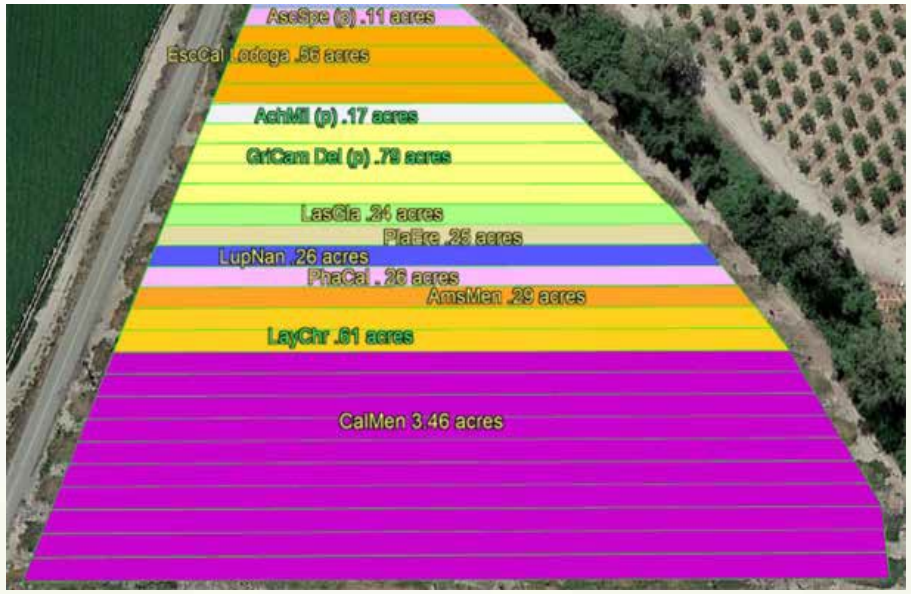
Amplification Planning

- Year-Round Activity Refined in Summer
- Contracts and Grants, Inventory, Projected Yields, Demand and Available Stock Seed
- BMPs to Maintain Genetic Integrity
  - CCIA Guidelines (Isolation Distances, Crop History, Generations)



Wildland Seed Collection Program

- Wildland Seed for Amplification and/or Nursery
- Manager, Assistant Manager, Seasonal Botany Technicians to Assist in Statewide Collections
- Collaboration with Partners Key to Success

<u>5 General Steps of Seed Collection</u>

- Obtain Permission to Collect
- Scouting
- Monitoring ripeness
- Collection
- Transport and Processing

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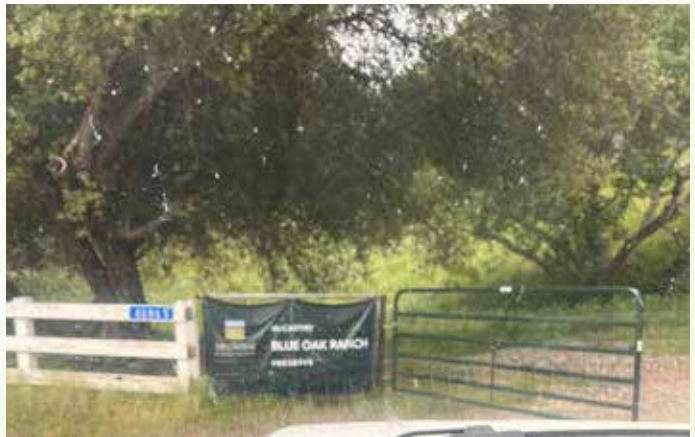
NATIVE SEED & PLANT SUPPLY

Obtaining Permission to Collect

- Private Land vs Public Land
- Developing Positive and Sustainable Relationships with Landowners
- Adapt to Various Communication Requirements



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Scouting

- Keying Out Species
- Depositing Voucher Specimens in Herbaria
- Develop Collection Strategy
- Evaluate Collection Capacity




Monitoring Ripeness

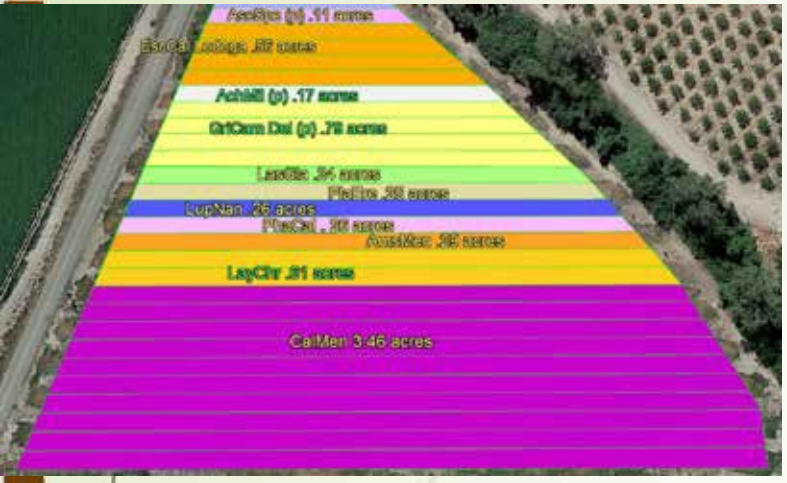
- Focus on Overall Ripeness of Population vs Individuals
- Note Signs of Predation or Stress
- Monitor Weather Patterns




Collection

- Collection Least Amount of Plant Material Possible
- Prevent Cross Contamination
- Ensure Safety of Crews

Expect the Unexpected



Planting

- Field Layout
- Custom-made Seed Drill
- Plugs when Seed is Limited
- New Species and Ecotypes

Field Maintenance

- Irrigation
  - Sprinklers to Germinate
  - Buried Drip tape to Sustain
- Weed Control
  - Cultivation
  - Herbicides
  - Labor Crews

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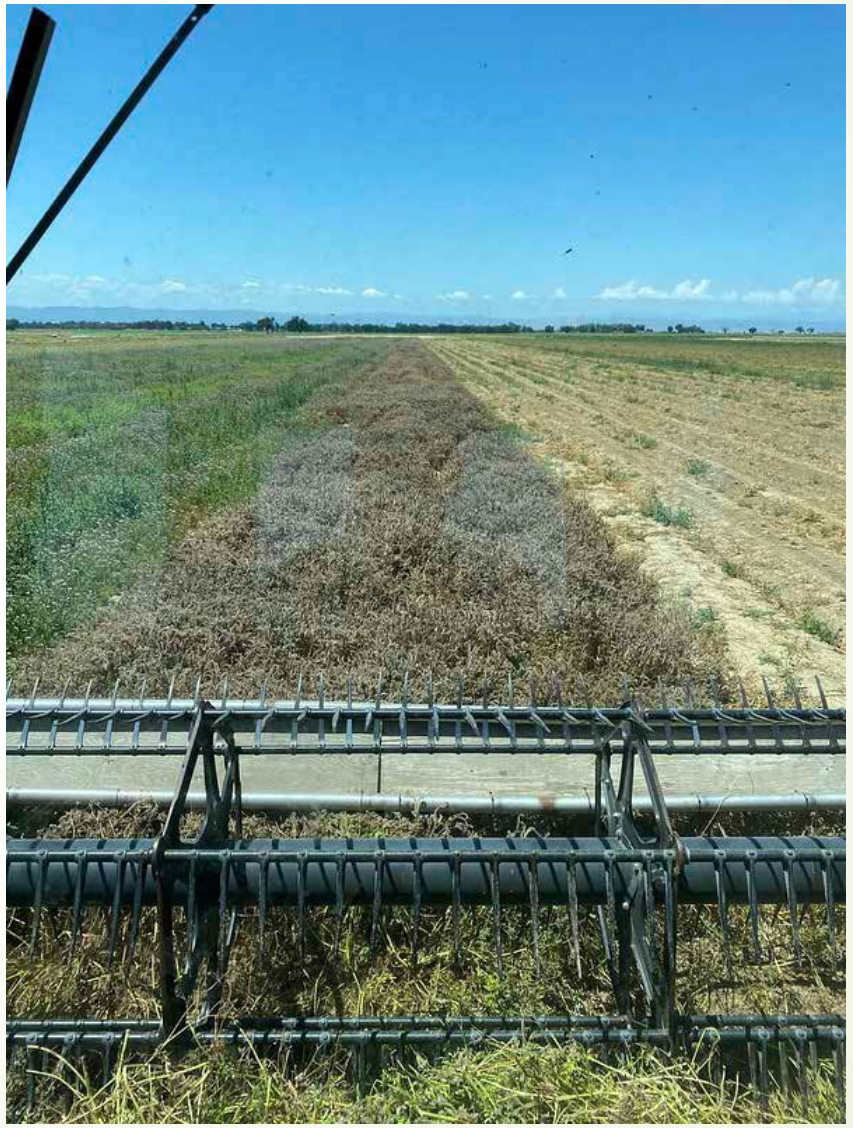
Seed Production: Mechanical Harvest



Swather

- First Step in Harvest
- Timing is Crucial
- Allows for Easy Pickup

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Seed Production: Mechanical Harvest

Combine:

- Critical First Step
- First Step in Seed Processing
- Picks Up Cut Material
- Removes Large Debris

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Seed Production: Hand Harvest

- Some Crops Require Manual Harvest
- Non-Uniform Ripeness Potential Seed Loss
- Labor Intensive Process

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Curing Seed: Drying Field Material

- After Swather Cut and After Combine
- Seed Dried on Tarps
- Frequently Flipped
- 6-8 % Moisture Content Before Cleaning

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Wildland Cleaning

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Seed Mill

- Majority of Cleaning
- Screens, Shaking and Blowing
- Screen Choices Differ by Species and Lot
- Time Intensive

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Gravity Table

- Last Step in the Cleaning Process
- Graded by Weight
- Heavy Seed is Kept
- Light Seed Becomes “Seconds” or Trash

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Finished Product

- High Purity
- Stored in 50 lb Bags
- Multiple Species mixed Depending on Order
- Orders are Hand Mixed, Bagged and Tagged

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Cold Storage

- Constructed to Increase Longevity
- Wildland and Low Generation Reduces Loss of Wildland Genetics

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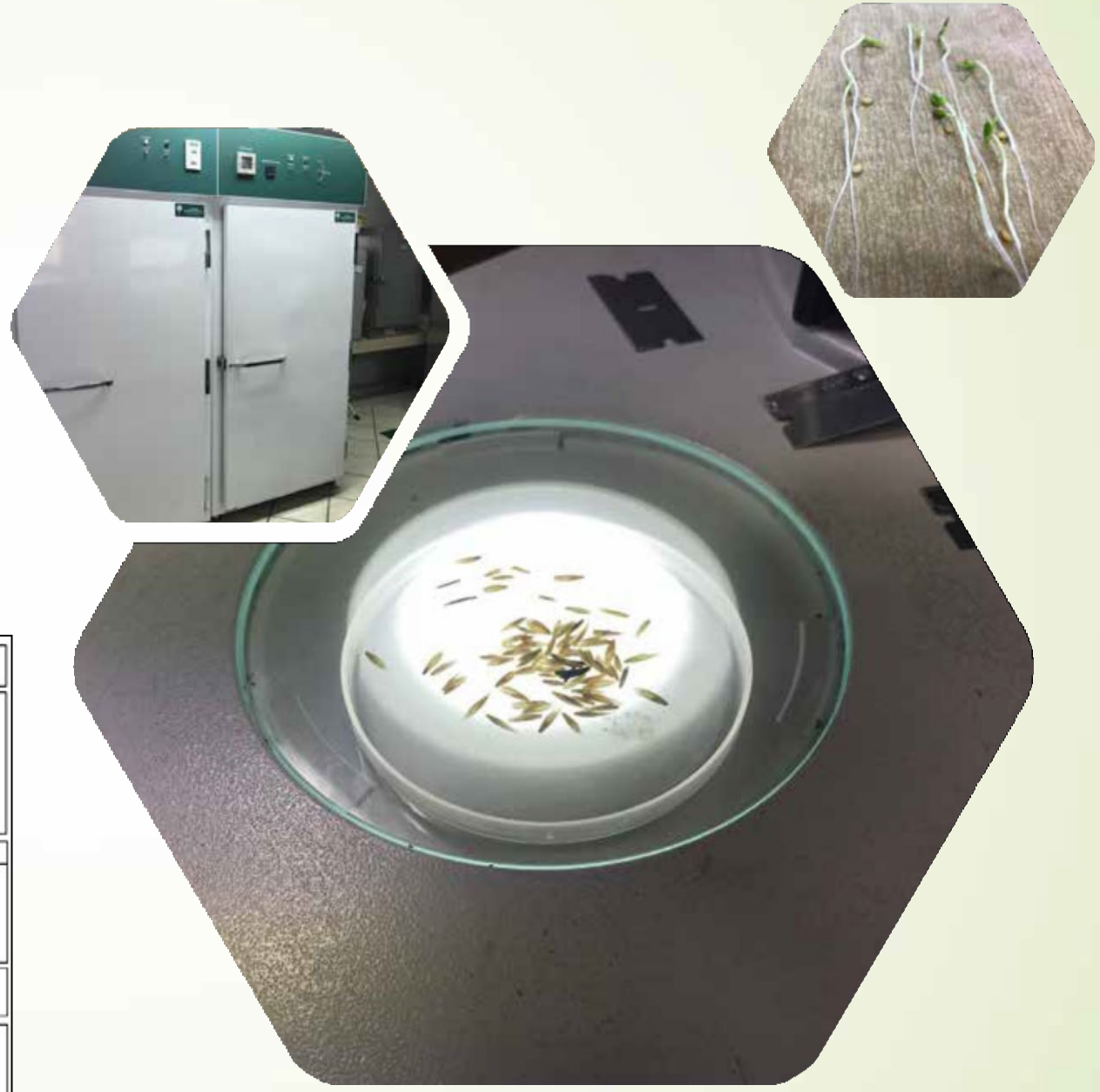
Seed Testing

- Purity and Viability
  - Other crop, weed content, noxious weeds
  - Germination, Dormant, Hard Seed
- High-quality Labs
- Live Seeds Used in Design, Planting Fields and Nursery Production



Account No.	Date Received	Date Completed	Lab Number
131	08/09/22	08/30/22	22-5970

River Partners
580 Vallombrosa Ave
Chico, CA 95926

Information Provided by Sender

Product	VNS
Kind	Lupinus microcarpus var. microcarpus
Genus/Species	Lupinus microcarpus var. microcarpus
Lot Number	LUPMICMI DR0025.22

Common Name : Chick lupine
Ecotype : Bear Valley Road, Colusa Co.

Purity Analysis

Component in 15.04 grams	Purity
Lupinus microcarpus var. microcarpus	99.48%
Weed seed	0.01%
Crop seed	0.08%
Inert matter	0.43%

Viability Analysis

Germ Date	Germ	Dormant	Hard	Viable
08/30/22	11	-N-	62	73

Other Crop Seeds in 278.4 grams	# per lb
Lupine *Lupinus sp.*	34

Noxious Weed Seeds in 278.4 grams — None Found
For: All States

Weed Seeds in 278.4 grams	# per lb
Knotweed, prostrate *Polygonum aviculare*	15

Other Determinations

Inert matter: Plant material, soil.
Live Seed / lb = 9,778
PLS = 72.62%
Viability of hard seed determined by Prechill : 8%
Viability of hard seed determined by TZ : 54%

Contract Growing Seed Amplification

- Local Seed Amplified from Wildland Stock Seed
- Seed Planted Directly in Field (best) or Grown out in Plugs and Installed
- Important Means to Make New Species Available

Nursery Operation

- Dozens of Species, Ecotypes Available, Many Thousands of Plant in Inventory
- Phytosanitary Operation
- Contract Grows
- Research and Collaboration

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Demonstration Garden

- Representation of Production Fields
- Trialing New Species and Ecotypes
- Small Plot Amplification
- Seed for Nursery Operation
- Plant Phenology Data Collection
- Observation of Pollinators, Pests, and Pathogens

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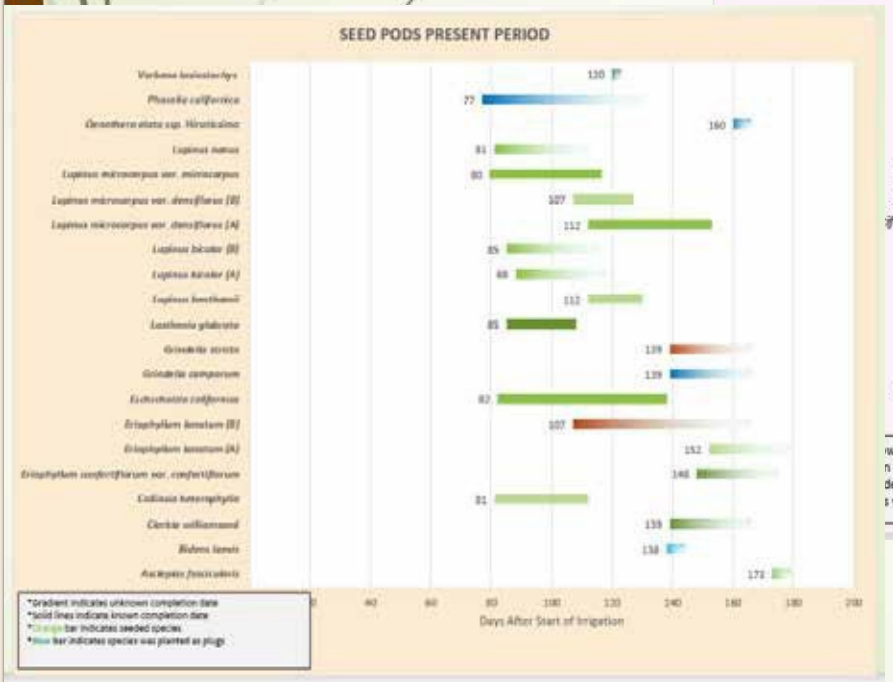
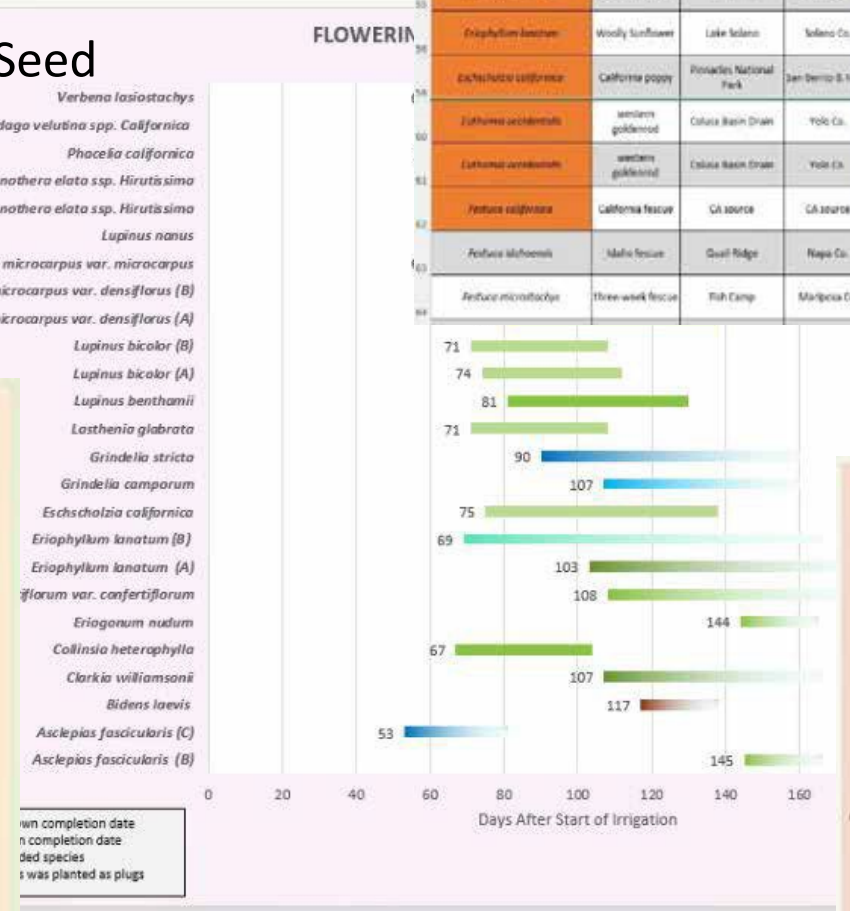
Demo Data Collection

- Weekly Data Collection
- Germination, Bloom Time, Seed Ripeness





Species	Common name	Ecotype	County	Usage	Bed/ Plot	Flower progress 5/24/24	Ripe seed progress 5/24/24	Health & Vigor 5/24/24	Notes and Follow-Up Action Needed 5/24/24	Flower progress 5/30/24	Ripe seed progress 5/30/24	Health & Vigor 5/30/24
Elymus multisetus	big squirreltail	Lake Port, Tehama Co.	Tehama Co.	Trial	B21-7	50-75%	1-25%	Good	Harvest begin 5.24.24	75-100%	1-25%	Good
Elymus triticoides	creeping wildrye	Yolo Bypass	Yolo Co.	Demo	BB-13	75-100%	0	Good	Root present/talk to Rich about cleaning	75-100%	1-25%	Good
Eriophyllum confertiflorum var. confertiflorum	golden yarrow	Rancho Canada del Oro	Santa Clara Co.	Demo	BB-8	75-100%	1-25%	Great	First ripe seed	75-100%	1-25%	Great
Eriophyllum lanatum	Woolly sunflower	Lake Solano	Solano Co.	Contract	B5-19-22	50-75%	1-25%	Great	First ripe seed. Some branches have broken from wind. Peak bloom/harvest in approx. 3 weeks?	75-100%	1-25%	Great
Eriophyllum lanatum	Woolly Sunflower	Lake Solano	Solano Co.	Contract	B6-21-22	25-50%	1-25%	Great	First ripe seed. Some branches have broken from wind. Peak bloom/harvest in approx. 3 weeks?	50-75%	1-25%	Great
Eschscholzia californica	California poppy	Pinnacles National Park	San Benito & Monte	Nursery/Amplify	B11-1-5	75-100%	25-50%	Good	Seed pods are getting smaller	75-100%	50-75%	FINISHED
Euthamia occidentalis	western goldenrod	Colusa Basin Drain	Yolo Co.	Nursery/Trial	B13-8-20	n/a	n/a	Vigorous!	Great example of potential height since it wasn't cut back	n/a	n/a	Vigorous!
Euthamia occidentalis	western goldenrod	Colusa Basin Drain	Yolo Co.	Nursery/Trial	B13-13-14	n/a	n/a	Vigorous!	Really vigorous, growing back from cut-back	n/a	n/a	Vigorous!
Festuca californica	California fescue	CA source	CA source	Nursery	B2-9-12	n/a	n/a	Great	Pulled top irrigation lines back last week, only sourcing irrigation from buried drip. Some height as last two	n/a	n/a	Great
Festuca idahoensis	Idaho fescue	Quail Ridge	Napa Co.	Demo	BB-7	100	0	Great	Seed close to ripe	100	0	Great
Festuca microstachys	three-week fescue	Fish Camp	Mariposa Co.	Demo	BB-3	n/a	n/a	Finished	n/a	n/a	n/a	Finished

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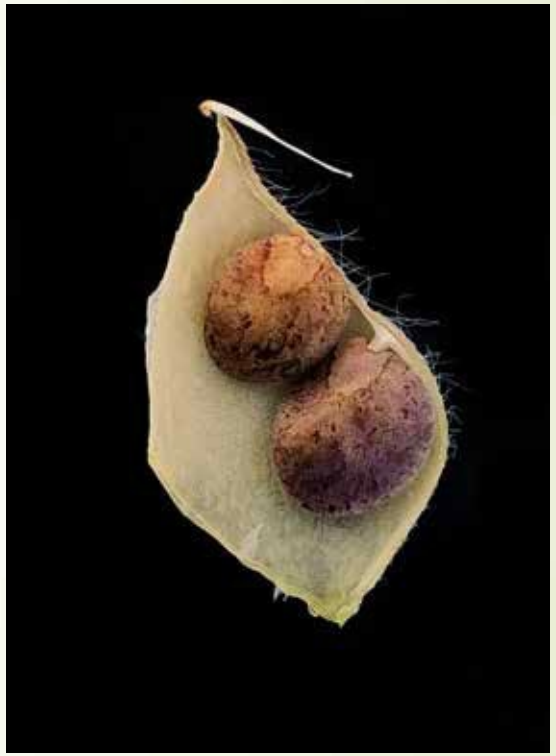

Lupinus microcarpus var. microcarpus, Chick lupine

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Klamath River Dams Removal Project

- Largest Dams Removal Project in US History
- Many Years of Seed Planning
- Nearly 100 Species Locally Collected, Amplified, Seeded on Site
- Nearly 2,000 Acres of Former Reservoir Footprints Seeded
- Model Project for Appropriate Planning for Source Identified Seed

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NATIVE SEED & PLANT SUPPLY

BLM Collaborations and Partnerships

- Battle Creek Seed Materials
- California Native Plant Materials
- Cosumnes River Watershed Seed and Plant Production

NATIONAL SYSTEM OF PUBLIC LANDS
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

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AB 179 – Multi Benefit Habitat Restoration Projects in the San Joaquin Valley and Tulare Basin (Native Seed R&D)

- Adam Gray – $40M Line Item in State Budget
- $1.7M Dedicated to Native Seed Research and Development
- Large-Scale Wildland Seed Collection and Amplification
  - 33 Collection Sites Cover Over 166,000 Acres Identified
  - 99 Collections Made in 2024; Similar Effort in 2025
  - 47 New Ecotype Amplifications in 2024-2025 Season

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NATIVE SEED & PLANT SUPPLY

Native Seed R&D

- Partners and Collaborators
  - WCB
  - Westervelt
  - Kern Water Bank
  - Sequoia Riverlands Trust
  - USFWS
  - CA State Parks
  - The Nature Conservancy
  - Wind Wolves Preserve
  - California Crop Improvement Association
  - RRG
  - City of Bakersfield
  - AERA
  - Stanislaus County
  - UCD
  - South Valley Biology
  - Ducks Unlimited
  - Stanislaus State
  - KRCE
  - RES

Layia fremontii & Achyrachaena mollis

Buttonwillow, Kern County

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NATIVE SEED & PLANT SUPPLY

Hamilton City Phase II Riparian Restoration

- 300+ Acres of New Riparian Restoration Within Setback Levees
- Natural Processes Provides Multiple Benefits – Flood Control, Groundwater Recharges, Habitat for Salmonids
- River Partners Signature Approach to Habitat Restoration

US Army Corps of Engineers®

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NATIVE SEED & PLANT SUPPLY

East Bay Regional Parks and Mid-Peninsula Open Space District

- East Bay Parks
  - Multi-year project
  - Year 1 – Parks Implemented Collections (*Achillea millifolium, Bromus sitchensis var carinatus, Stipa pulchra*) and HG Amplified
  - Year 2 HG Collected (*Eschscholiza californica*, *Perideridia californica*, *Hemizonia congesta ssp. Luzulifolia)* and amplified
  - Grassland Restoration and Soil Stabilization
  - Development of New Ecotypes for Bay Area Restoration

- Mid Peninsula Open Space District
  - Multi-year Contract to Amplify Source Identified Seed

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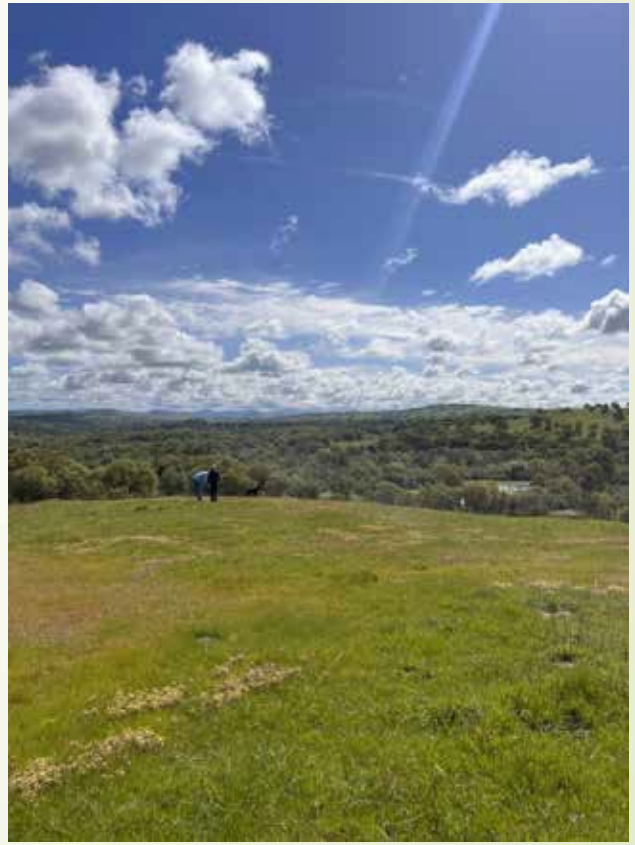
Lower Tuolumne Salmon Habitat Restoration Program

- Modesto Irrigation District, Tulare Irrigation District, SFPUC
- Building a Seed and Plant Program For Numerous Large-scale Restoration Projects on the Lower Tuolumne River
- Applied River Sciences (McBain Associates)
- 45 Species Scouted
- 21 Species Collected
- 6 Species in Amplification
- Continue Multi-year Project in 2025



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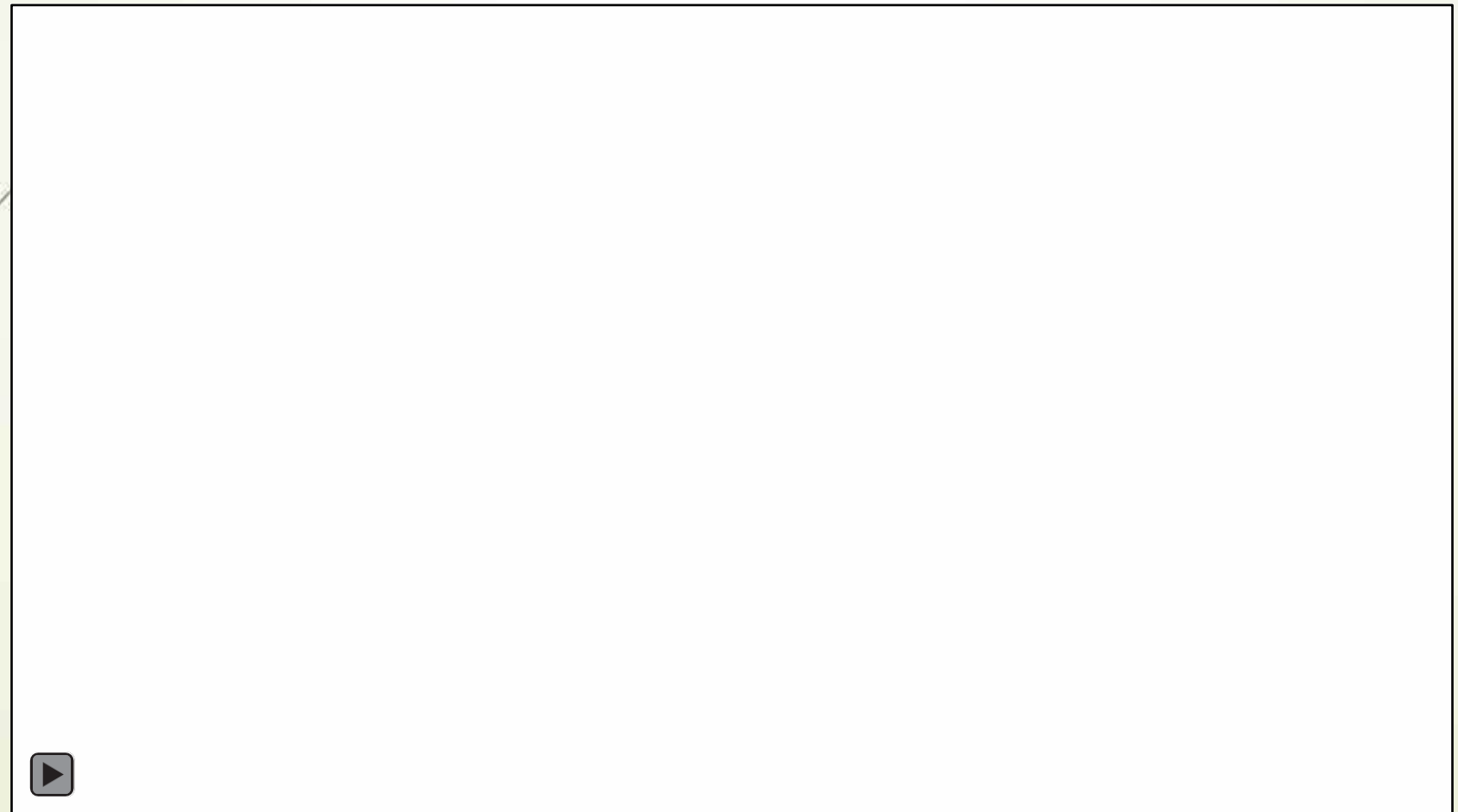
Lookout Slough Freshwater Tidal Restoration

- Largest Freshwater Tidal Restoration Project in California
- Source Identified Native Seed and Plants



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East Table Bluffs Grasslands Restoration

- WCB Funded Project with Mattole Restoration Council
- Amplifying 9 Species Over Two Years to Support Project
- Expands Availability of Very Limited Local Ecotypes Available in the North Coast

MATTOLE
RESTORATION COUNCIL Community watershed restoration since 1983

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CARCD - Climate Resilient Restoration Project

- Climate Resilient Habitat Restoration Involving most RCDs in California
- RCD's Collect Wildland Stock Seed, Heritage Growers Grows Out
- Avenue to Providing New Ecotypes for Regional Restoration
- Formation of North Bay Native Seed Collaborative (?)
- Model Project for Developing Source Identified Native Seed

CALIFORNIA ASSOCIATION OF
RESOURCE
CONSERVATION DISTRICTS

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NATIVE SEED & PLANT SUPPLY

CARCD – Climate Resilient Habitat Restoration

General Guidelines and Procedures for

WILDLAND SEED COLLECTION

One of the most beneficial things you can do for local ecosystems is incorporate native plants and wildflowers into your garden and landscaping projects. Determining the purpose and use of seed, where to scout, and using the appropriate techniques will help you build a high quality seed collection.

WHERE TO START WHEN PLANNING A COLLECTION

- Define the purpose and use of seed collection.
- Locate collection areas
- Consult with Heritage Growers on approach, including target species.
- Obtain permission to collect. Could be as simple as an email or as complex as a signed permit.
- Estimate target quantities for collection (see target seed quantities box)

INITIAL SITE ASSESSMENT

- Identify species of interest to monitor and collect early in the season. Conduct an informal preliminary site assessment: soil type, sun/shade exposure, elevation, ecosystem type, vegetation composition (dominant and co dominant species), population size of target species.
- Provenance
  - *Wild collections are collected directly from sources that are naturally occurring.*
  - *Restored sites are sites that ha*

the past. Check with Heritage Growers to determine if collection would be appropriate.

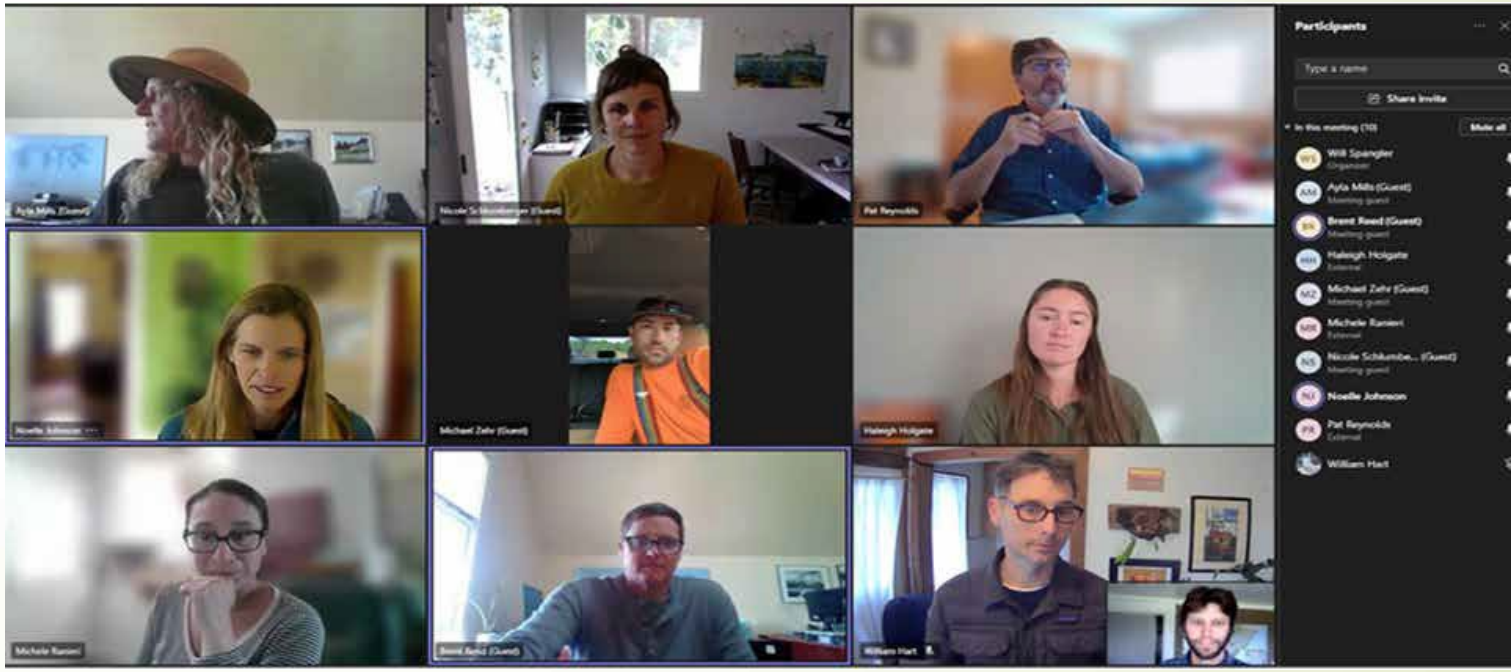
- Know the maximum limit of permitted collection quantity based on population size, and if seed has already been dropping
- Are there enough specimens on site to reach your project goals, including limitations on allowable collection quantities?
  - Finding another site for supplemental collections may be applicable if site conditions are similar.
- Verify species identification
  - Utilize herbariums and online/written resources to properly identify the species you plan to collect.

SCOUT AND MONITOR FOR RIPENESS AND READINESS TO COLLECT

- Begin monitoring selected species just after flowering when fruits are becoming visible.
- Conducting site visits as often as necessary to monitor seed maturation, insect damage (if any), and other activity that happens on the land (cattle grazing, herbivory, recreation)

well as surrounding

1 / 4



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CARCD Amplification Approach

- Mostly Small Plot (0.10 acre) Amplifications
  - Small Enough to Accommodate Reasonable Collections (Minimum 10,000-13,000 Live Seeds) for Plug Planted Plots
  - Large Enough to use Mechanized Equipment
  - Enough Seed Production to Scale-up



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NATIVE SEED & PLANT SUPPLY

Xerces Society Collaborations

- Monarch Kits Program
- California Milkweed and Blue Dicks Germination Trials

***Asclepias californica* Germination Trial**

Viability Analysis				
Days Tested	Germ %	Dormant %	Hard %	Total % Viable
21	5	84	-N-	89

Treatment	Method	Qty Started	Qty Germ	% Germ
1	38 day cold strat	592	506	85.47%
2	24 hrs heat soak + 38 day cold strat	592	42	7.09%
3	Tip cut + 38 day cold strat	592	162	27.36%
4	*Tip cut +24 hr heat soak + 38 day cold strat*	*592*	*15*	*2.53%*

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National Park Service - Native Seed Production Research for Post-fire Landscapes

- 5 Year Cooperative Agreement
- Producing Source Identified Native Plants
- Amplifying Ecotypes for Restoration of NPS Lands
- Expanding Seed Production Capacity
- Sharing Knowledge

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NATIVE SEED & PLANT SUPPLY

Dos Rios Riparian Restoration and State Park

- 1,600-Acre Riparian Restoration at Confluence San Juaquin and Tuolumne Rivers
- California's First New State Park in 13-Years
- Native Use Garden
- Remarkable Native Herbaceous Understory

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NATIVE SEED & PLANT SUPPLY

Caltrans - Willits Bypass Freshwater Wetlands

- Large-scale Habitat Restoration and Conservation Project
- Collecting and Amplifying Source-Identified Native Seed
- More than 20 Species Collected and 15+ Amplifications

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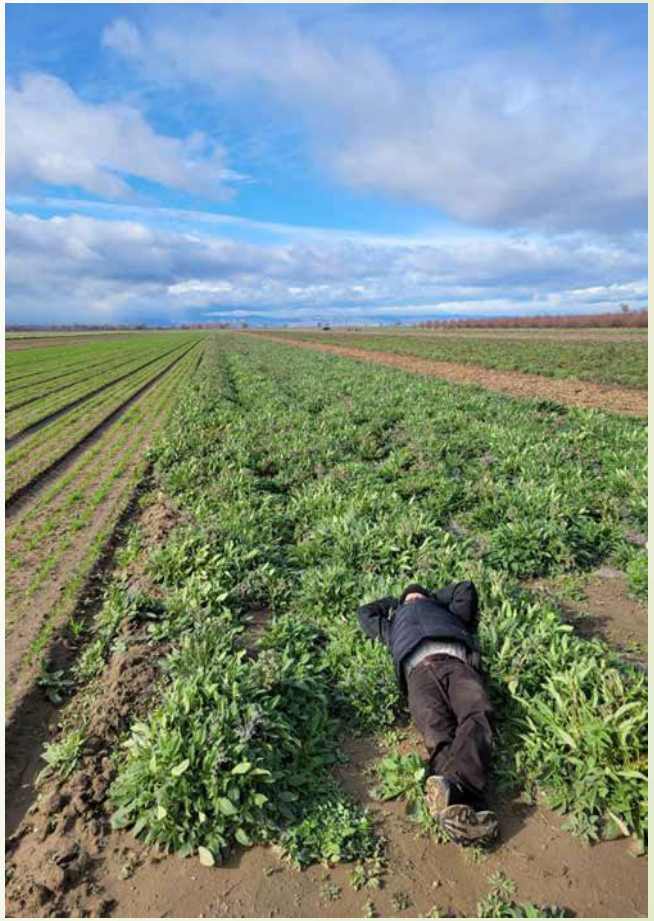
NATIVE SEED & PLANT SUPPLY

Partnerships and Collaborations

- Federal, State, Local Agencies
- Private Industry
- Non-Profits
- Tribes
- Field Tours



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Thank you!
Questions?

Pat Reynolds

- preynolds@heritagegrowers.com
- 916-769-7076

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Cutters, implements Tyler made for bed shaper – ask him for more details

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Outline Brainstorm

- I. Note on going from first symposium in 2017 to key note
- II. Heritage Growers and what we are trying to do and how we got here. - Wanted to have more control of seed avaiable for projects
- II. Overview of the talk – importances of large-scale conservation, maintaining local genetics (do it right)
- III. Note on John Anderson
- IV. Seed bottleneck and NSF Report, California Native Seed Strategy, Others
- V. General Process overview
- VI. Seed Amplification Planning – BMPs and Texas blue bonnet example, CCIA's role
- VII. Wildland Seed Collection
- VIII. Demo Garden
- IX. Seed Amplification (Seeding, Planting, Weed control, Irrigation, Harvest, Drying)
- X. Seed Cleaning
- XI. Seed Storage
- XII. Seed bagging, tagging, order fulfillment
- XIII. Operations and Data Tracking

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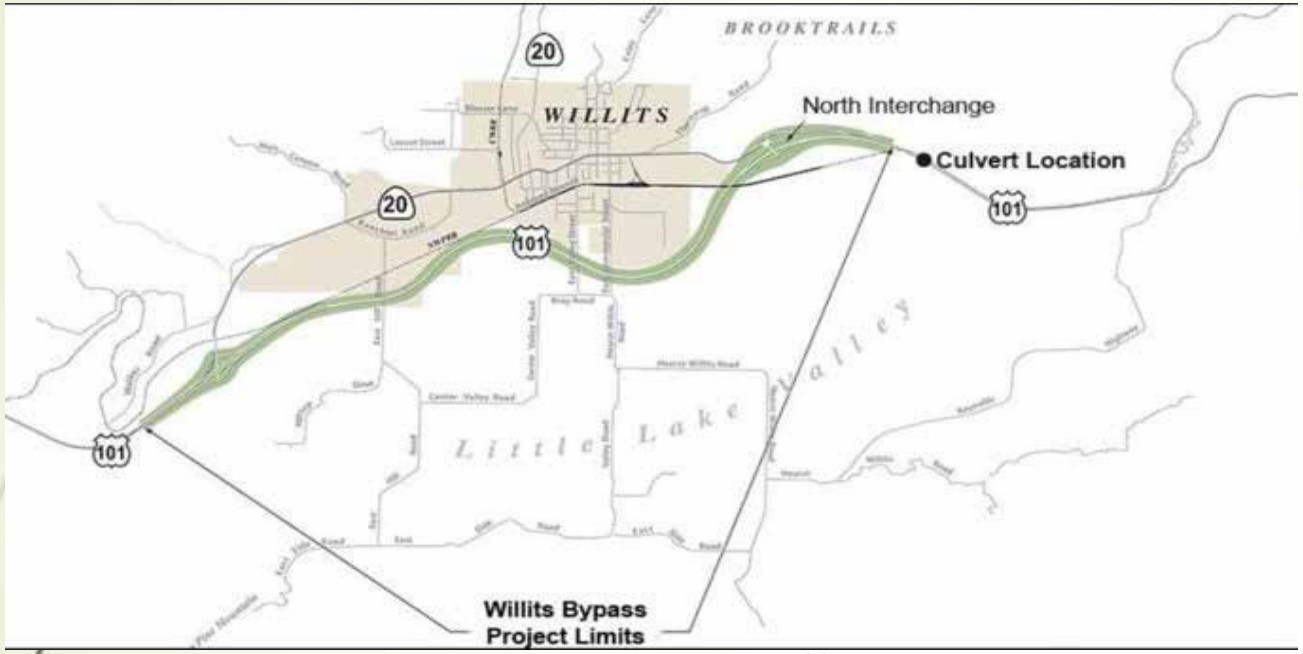
Willits Bypass Project



- Conceived decades ago to solve traffic issues on Highway 101
- Many years of negotiations and project approvals
- Significant biological impacts
- Significant mitigation requiring lots of locally sourced seed and plants
- Hanford ARC, Mendocino County RCD, Caltrans

Figure 1-1
Regional Location

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Outline Brainstorm

- XIII. Projects
- Seed R&D
- CARCD
- Willits
- BLM Plant Materials
- BLM Rancho B.
- BLM Cosumnes
- NPS
- East Bay Parks
- Mid Pen
- IX. Summary
- - Important time for conservation and native seed, real opportunities despite change in administration, need to get origin into specifications, need to get advanced planning for seed projects, need to fund getting new ecotypes into production,
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-

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- KEYNOTE SPEAKER INFORMATION FOR NCB WEBSITE

- 2025 Keynote Speaker: Patrick Reynolds

- The 2025 Symposium Keynote Speaker is Patrick Reynolds. Pat is the General Manager of Heritage Growers, a non-profit native plant materials production facility that is a part of River Partners. The subject of his talk is “Production of Native Seed Ecotypes to Support Diverse Large -scale Conservation Efforts in California."

- Pat Reynolds is a restoration ecologist with more than 30 years of professional experience in the design, implementation and monitoring of habitat restoration projects including the effective use of native seed. He is the Director of River Partners’ Native Seed and Plant program, the former General Manager of Hedgerow Farms and a past Associate Restoration Ecologist at H.T. Harvey & Associates. Pat sits on the board of the California Native Grasslands Association, the Yolo County Planning Commission and is the Restoration Ecologist on the Science and Technical Advisory Committee for the Yolo County Habitat Agency. In the habitat restoration profession, Pat is known for his integrity, friendliness, and habitat restoration expertise. He brings his in-depth knowledge of habitat restoration to every project and particularly enjoys providing recommendations to clients and collaborating with partners.

- River Partners was founded in 1999 to change the approach to large-scale habitat restoration in California. After two decades of driving large-scale habitat restoration, they learned that the quality of native seed used on restoration projects matters. Seeds and plants perform better if they originate from wildland locations with similar soils, hydrology and climate to sites being restored. At River Partners, they weren’t always able to obtain locally appropriate seeds for their restoration projects. In 2021, they created a new kind of seed and plant company to fill this gap, thus Heritage Growers was born.

- The production of source-identified native seed (seed of known genetic origin) is an essential component of restoring and enhancing resilient, high-quality habitat. The numerous steps required to produce source-identified native seed are complex, detailed, and must be implemented carefully and correctly to produce habitat restoration appropriate native seed. Heritage Growers (HG) has taken on the ambitious task of developing new ecotypes and producing large quantities of source-identified native seed to support conservation efforts in California. HG is a fully integrated restoration-appropriate native seed and native plant producer that includes a wildland seed collection team, a large-scale farming operation with 208 acres of native seed production and growing, a demonstration and research garden, seed cleaning facility, seed storage facility, and a nursery operation all designed to support habitat restoration efforts in California. HG is partnering with Federal, State and local agencies, non-profit organizations, tribes, conservation bankers, restoration contractors and landowners to provide the seed, plants, and guidance needed to successfully establish native vegetation that is appropriate for each restoration project. Pat will take you through the native seed production process, talk to you about the numerous and diverse ways that HG is working with partners to help them achieve their habitat restoration goals while weaving in the many intricacies involved in running a non-profit organization program that provides products that do not follow the economic rules associated with the production and sales of most commodities.

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- 45 minute presentation + Q&A
- “Our symposium theme involves diversity, collaboration & partnerships” – hit upon that hard
- Hit each of the elements of production of source identified native seed to support restoration (collections, seeding, planting, maintenance, harvest, storage, bagging and tagging, sales and use)
- Bring in lots of cool and interesting photos
- Be a bit more free form and tell lots of stories – try not to get too technical
- Having the talk include the native seed bottle neck, the NSF report, the California Native Seed Strategy, the weird economics of native seed
- Talk about how native seed is really a hot topic these days – the “hey day” for native seeds
- Look closely at Jennifer Jewells National Native Seed Conference Keynote for inspiration and ideas
- Got into some depth on wildland seed collection including difficulty getting access, limitation on seed use from public lands, SOS program, verification with BLM, stories about break-ins, car wrecks, challenges in calling ripeness, etc.
- Talk about John Anderson and his pioneering works and how it is an inspiration for me. Look at John Anderson issue of Grasslands for stories and themes.
- Tours with photos
- Mention how seed is thought to evolve toward the farm and our work with Boulder on this
- Interesting projects to cover – CARCD, Willits, East Bay Parks, Seed R&D, NPS, BLM (2x), Native Seed R&D, Mattole, Xerces collaboration, germination tests work,
- Cover nursery and how seed does not always work – Juncus, Carex and Warm Season Grasses
- Mention to talk about CCIA and the certification program
- Talk about specs and what is needed to ensure source identified seed is being used
- Go into cleaning and innovation
- Talk about demo garden, its many uses and lots of cool photos
- Look again at SER issue on native seeds for technical details and topic areas
- Cover seed testing in some detail
- Talk about storage including climate controlled storage and seed longevity
- Talk about the process of starting with small plots and then amplifying based on limited seed
- Texas lupine story
-

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Seasonal Routines

- Demonstration garden plots are maintained predominantly by hand labor, including seeding, cultivation, and harvest
- Reshape beds of annual species
- Experimenting with moving to no till, added compost and gypsum in fall 2024 to entire field
- Native straw is used to mulch beds with forbs
- Pest protection is applied as needed
- Planting plans are designed with hydrology, isolation distance, seasonal bloom times, habitat values, companion planting, and point of interest

ADD photo of netting for bunny protection

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Tending species of importance

- Growing out plugs can sometimes run late into the planting season
- Utilizing seasonal protection can help transition species from greenhouse to field
- Trialed mulch applications and shade cloth variants
- Example seen here:
  Seed amplification of Asclepias cordifolia for Xerces Pollinator Habitat

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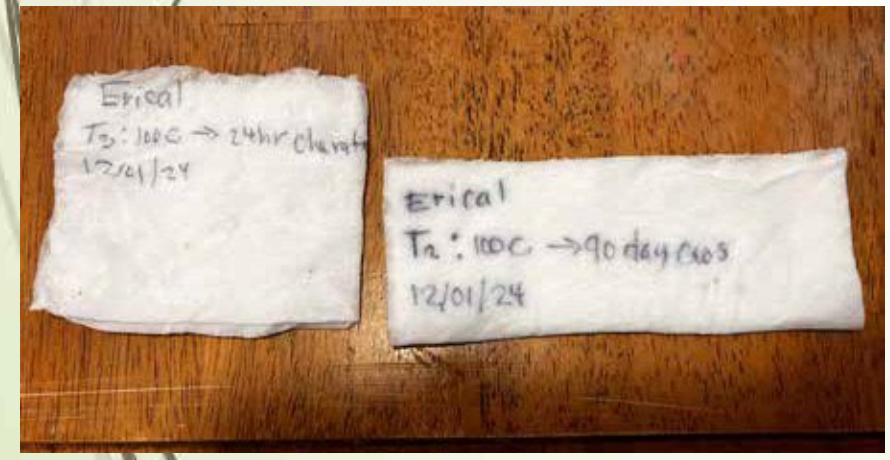
BLM- CA Native Seed and Plant Amplification

Sulferic acid soak on *Arctostaphylos viscida.* Each bowl will soak for a different number of hours

Eriodictyon californicum going into cold storage for 90 days



For treatments of *Arctostaphylos viscida* going into cold storage for 90 days

Xerces Society

Asclepias califonica and *Dipterostemon capitatus* germination research trial

Left: Treatment 1
Right: Treatment 2

XERCES SOCIETY
for Invertebrate Conservation

Dipterostemon capitatus/Dichelostemma capitata Germination Trial

Viability Analysis				
Days Tested	Germ %	Dormant %	Hard %	Total % Viable
14	6	86	-N-	92

Treatment	Method	Qty Started	Qty Germ	% Germ
1	No cold strat	650	12	1.85%
2	30 day cold strat	632	277	43.83%
3	90 day cold strat	0	0	n/a

XERCES SOCIETY for Invertebrate Conservation

Ascle:pias calif'ornica Germ'ination Trial

Viability Analysis

Days T'ested	Germ :%	Dormant %	Hard .%	Tota lo Viable
21	5	84	-N-	

Treatment	Met od	Qty Started	Qty Germ	% Germ
1	38 day cold st rat	592	506,	85 „,47%
2	24 hrs heat soak+ 38 day cold strat	592	42	7„09%
3	Tl cut+ 38 day cold st rat	592	162	27. 36%
4	*Tip cut +24 hr heat soak +.3,8 day cold strat*	*592*	*15*	*2.53%*

Bot

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Seed Amplification of Little Lake Valley Species

Species Name	Direct Seed, Transplant
Deschampsia danthanoides	Transplant; large plot
Hordeum brachyantherum	Direct seed; large plot
Pleuropogon californicus var. davyi	Transplant; large plot
Cyperus eragrostis	Direct seed; large plot
Beckmannia syzigachne	Direct seed; large plot
Agrostis exarata	Direct seed; large plot
Artemisia douglasiana	Direct seed; large plot
Deschampsia cespitosa	Direct seed; large plot
Elymus glaucus	Direct seed; large plot
Sisyrinchium bellum	Transplant; large plot
Ambrosia psilostachya	Direct Seed; demo garden
Camassia quamash	Direct Seed; demo garden
Danthonia californica	Transplant; demo garden
Eryngium aristulatum	Direct Seed; demo garden
Persicaria amphibia	Direct Seed; demo garden
Sium suave	Direct Seed; demo garden

Wildland Seed Collection in Little Lake Valley

- Developed seed procurement approach with Caltrans
- Seed for direct seeding and nursery propagation
- Providing wildland stock seed for amplification
- Additional seed collected to support restoration in region

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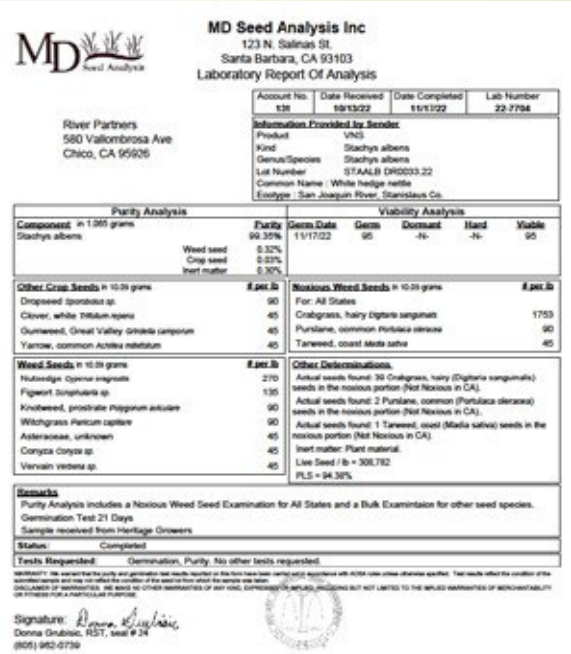
Cleaning Seed: Mill Operations

Wildland Seed Collection

- Locate Collection Sites
- Obtain Permission to Collect
- Data on Collection Sites
- Monitor for Ripeness
- Volatility in Yearly Seed Production
- Testing for Viability/Live Seeds



MD Seed Analysis Inc
123 N. Salinas St.
Santa Barbara, CA 93103
Laboratory Report Of Analysis

Account No.	Date Received	Date Completed	Lab Number
126	10/13/22	11/17/22	22-7704

River Partners
580 Vallombrosa Ave
Chico, CA 95926

Information Provided by Sender

Product	VNS
Kind	Stachys albens
Genus/Species	Stachys albens
Lot Number	STAALB DR0033.22

Common Name : White hedge nettle
Ecotype : San Joaquin River, Stanislaus Co.

Purity Analysis

Component in 1.065 grams	Purity
Stachys albens	99.35%
Weed seed	0.32%
Crop seed	0.03%
Inert matter	0.30%

Viability Analysis

Germ Date	Germ	Dormant	Hard	Viable
11/17/22	95	-N-	-N-	95

Other Crop Seeds in 10.09 grams	# per lb
Dropseed Sporobolus sp.	90
Clover, white Trifolium repens	45
Gumweed, Great Valley Grindelia camporum	45
Yarrow, common Achillea millefolium	45

Noxious Weed Seeds in 10.09 grams	# per lb
For: All States	
Crabgrass, hairy Digitaria sanguinalis	1753
Purslane, common Portulaca oleracea	90
Tarweed, coast Madia sativa	45

Weed Seeds in 10.09 grams	# per lb
Nutsedge Cyperus eragrostis	270
Figwort Scrophularia sp.	135
Knotweed, prostrate Polygonum aviculare	90
Witchgrass Panicum capillare	90
Asteraceae, unknown	45
Conyza Conyza sp.	45
Vervain Verbena sp.	45

Other Determinations

Actual seeds found: 30 Crabgrass, hairy (Digitaria sanguinalis) seeds in the noxious portion (Not Noxious in CA).
Actual seeds found: 2 Purslane, common (Portulaca oleracea) seeds in the noxious portion (Not Noxious in CA).
Actual seeds found: 1 Tarweed, coast (Madia sativa) seeds in the noxious portion (Not Noxious in CA)
Inert matter: Plant material.
Live Seed / lb = 308,782
PLS = 94.36%

Remarks
Purity Analysis includes a Noxious Weed Seed Examination for All States and a Bulk Examintaion for other seed species.
Germination Test 21 Days
Sample received from Heritage Growers

Status: Completed
Tests Requested: Germination, Purity. No other tests requested.

Signature:
Donna Grubisic, RST, seal # 24
(805) 962-0739

Processing Wildland Seed

- Seed May Need 1-6 Weeks to Dry
- Target Moisture Content of less than 10%
- Fluffing Material on Consistent Basis
- Proper Dehydration is Essential for Effective Cleaning and Maintaining Viability

Harvest

- Calling Ripeness
- Swather
- Combine
- Small Equipment
- Hand Harvest
- Drying
- Cleaning

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Seed Cleaning

- High Purity and Viability Goal
- 3 Machines
  - Clipper
  - Indent
  - Gravity Table
- Manual
- Small Lots Cleaning Equipment
- Lots of technique and ingenuity involved
- Ability to clean hundreds of different species and ecotypes

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BLM- CA Native Seed and Plant Amplification

- 5-year Project
- Nursery Grow Out for Various BLM Officies
- Amplifying 8 Items this Year; Amplifications Expanded Yearly
- Using Old SOS Collections Stored in the Bend Extractory
  - Proper Storage in Bend Show High Viability Maintained Years
- Germination Trials on 7 Species Underway