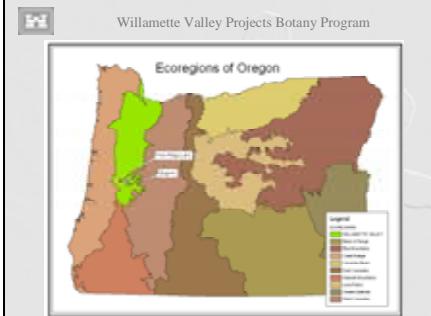
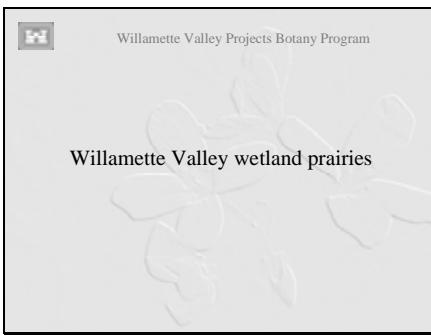


In this presentation, I will discuss the nature of the prairie, the management challenges, and the management responses.

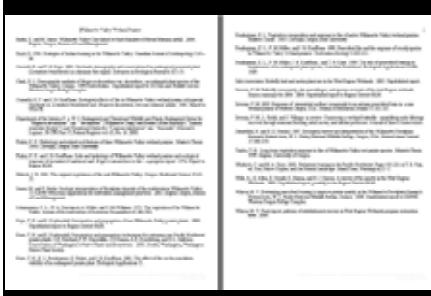


The Willamette Valley is located west of the Cascade crest in an essentially maritime climate. Over forty inches of rain falls on our sites, primarily between October and June, leaving us with a summer drought climate.

I'll address two prairie types: Our wetland prairies are high-quality remnants that primarily require maintenance, while our uplands are degraded sites that harbor important species. The uplands require more comprehensive treatments.



We'll begin with the relatively pristine wetland prairies.



The history of managing these communities is relatively short. There's no book like the [Tall Grass Prairie Restoration Handbook](#). There is no direct connection to Aldo Leopold: the University of Wisconsin has been doing prairie restoration work since the 1930s. Concern for the Willamette Valley wet prairie only dates from the '80s. Here we see most of the relevant literature: three M.S. theses, lots of gray literature, and a number of peer-reviewed publications

So what are these wetland prairies?

They are wet. But they are only wet for part of the year.

Six months ago, one of our sites look like this.





Three months ago, the site looked like this.

Now (in August), the cracks in the soil can be a meter deep, the grasses are dry, and there are a few composites in bloom

Going back a little further:

--10,000 years ago, a hot period after glaciation promoted the establishment of grasslands

--7,000 years ago, Mt. Mazama exploded, leaving Crater Lake and a layer of ash that remains as an impermeable clay layer below the wet prairies

--As the climate cooled, frequent fires maintained the prairie against tree invasion

--160 years ago, a farming civilization arrived, suppressing fires and eventually converting over 99% of these prairies to wheat and rye grass fields, then to shopping malls and parking lots.

--Now, a very few high quality remnants are managed by various public agencies and The Nature Conservancy

Over 200 spp. were recorded from our sites. Most are native, and many are endemic either to the region or the prairie type.

Deschampsia caespitosa is the most important grass, although there are other important grasses and sedges



Forb diversity is high. *Cardamine penduliflora* is endemic to the Willamette Valley



Cicendia quadrangularis, a little annual gentian, is on Heritage list 2



Spiranthes romanzoffiana, an orchid, is widespread in wet sites, but never abundant.



Pyrrocoma racemosa var. *racemosa*: there are only 5 sites in Oregon (three at Fern Ridge). There is question about the taxonomy: are these really related to the California material? In any case, our sites are disjunct at the northern edge of the range, and are thus high priorities for conservation.

We are collaborating in research including breeding system work, germination requirements, some crosses to look for inbreeding depression, and extensive propagation.



Orobanche californica ssp. *californica* is on the Heritage gray list. It has no chlorophyll, and is parasitic on Asteraceae, probably *Grindelia* (gum weed).



Amanita sp. nov. "pruittii" Appears to be a wet prairie endemic. It is undescribed. Stephanie McKnight, a STEP employee, produced a DNA sequence that places it near other *Amanitas* that lack mychorrhizal connections.

The wet prairie also hosts animals, from mollusks to meadowlarks: an unusual breeding colony of grasshopper sparrows; a rare bee that specializes on *Grindelia*; an undescribed Tephritid fly that's a seed predator on *Aster curtus*.

In short, these fragments are loaded with the remnants of important populations and processes.

Although the wet prairie itself is pretty unusual, the primary management challenges are common to prairies throughout North America:

- keeping out woody invaders
- keeping out exotic species
- keeping the rare plant populations healthy

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Wet prairie management challenges

- Maintaining "herbaceousness"
- Maintaining nativity
- Sustaining or increasing rare plant populations

A photograph of a wet prairie landscape, showing a mix of green vegetation and water, with mountains visible in the background.

Behind the impoundments, you see Oregon ash invading a wet prairie site



Here meadow knapweed at on a wet prairie is mapped in relation to rare plant sites.

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Species	Fed. Status	State Status	ORNHC	Heritage Rank
<i>Erigeron decumbens</i> Nutt. var. <i>decumbens</i>	E	E	I	G4T1S1
<i>Isotoma menziesii</i> ssp. <i>fendleri</i> Macbr.	E	—	I	G3T1S1
<i>Lomatium nudicaule</i> Rose ex Mathias and Constance	E	E	I	G2/S2
<i>Lupinus sulphureus</i> Dougl. ex Hook. ssp. <i>kincaidii</i> (C.P. Sm.) L. Phillips	T	T	I	G3T2/S2
<i>Aster carolinianus</i>	SoC	T	I	G3/S2
<i>Dolichos cordigerus</i> T.J. Howell	SoC	C	I	G1Q/S1
<i>Hordeum compactum</i> Dougl. Ex Hook. ssp. <i>congestum</i> (Piper) C.L. Hitchc.	SoC	C	I	G4T2/S2
<i>Lathyrus holochlorus</i> (Piper) C.L. Hitchc.	SoC	—	I	G2/S2

E: listed endangered; T: listed threatened; SoC: species of concern; C: candidate.

Heritage list 1 species of prairies at Fern Ridge. This list also includes the Fender's blue butterfly and Kincaid's lupine system, which I'll discuss under upland prairies.



Lomatium bradshawii is listed endangered: good science shows it increases under frequent burning



Erigeron decumbens is listed endangered. It is characteristic of wet (and upland) prairie. Preliminary research suggests that small sites are not viable, possibly due to inbreeding problems.

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Wet prairie management responses

- Prescribed fire
- Mechanical treatment
- Manual treatment
- Herbicides
- Culture of rare spp.

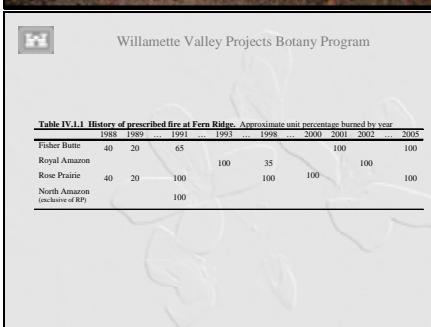
The methods we use to approach these management challenges are really fairly predictable. They can overlap in the challenges they address – and sometimes conflict with some of the prairies' needs.



Several lines of evidence indicate the importance of fire: historical (settler accounts, ethnographic results), ecological (Pendergrass, woody plant response), demographic (LOBR)

Fire functions to reduce the woody vegetation, both exotic and native, and to promote population numbers of Bradshaw's lomatium.

On the other hand, fire is a disturbance – and so it may increase the risk of exotic invasion (*Anthoxanthum* and *Hypochaeris* are good examples)



We achieve this work through an Economy Act agreement with the Eugene BLM district, who call on wildland fire fighters from USFS, State forestry, and BLM on burn days.

Our mean fire return interval 3.6 years for unit portions included in early research burns. We intend an interval closer to 2 years, primarily based on Lomatium demography.



That's a decent success rate given the constraints, and the effects are decent – woody plants are much reduced, Lomatium is stable, occasionally increasing in years immediately following fire.

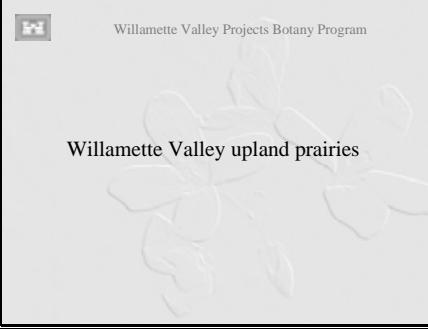
But certain weeds may be increasing.



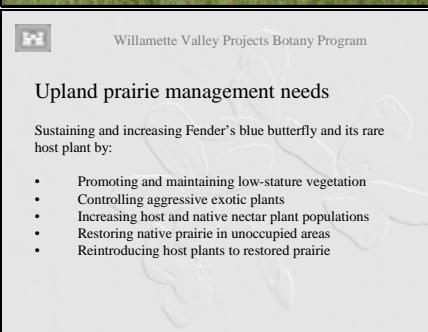
Mechanical means such as mowing, as well as more exotic methods are primarily used as a supplement to fire, which doesn't harm mature ash. Hand treatment is a further supplement.



Herbicide treatment, so far used primarily against reed canary grass and as a cut stump treatment, further supplements fire, mechanical, and manual treatments.



Willamette Valley upland prairies



Upland prairie management needs

Sustaining and increasing Fender's blue butterfly and its rare host plant by:

- Promoting and maintaining low-stature vegetation
- Controlling aggressive exotic plants
- Increasing host and native nectar plant populations
- Restoring native prairie in unoccupied areas
- Reintroducing host plants to restored prairie

While wet prairies are important remnants of relatively intact plant communities, the upland sites are pretty heavily degraded, with remnants of important features.

The sites are currently dominated by exotic grasses, although there is an important native component.

The listed species drive the management of these sites, and decent studies describe their needs.

Kincaid's lupine is listed threatened,

and is the primary host of the endangered Fender's blue butterfly.





Research shows that this insect requires abundant host plants and abundant native nectar plants: exotic species do not provide the high-quality nectar the butterfly needs.

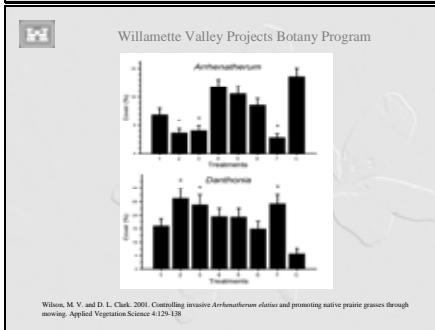
Both the host and the nectar plants suffer from tall competitive exotics like blackberry, Scot's broom and tall oatgrass

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Upland prairie management methods

- Fall mowing to reduce brush
- Spring mowing to reduce tall oatgrass
- Manual treatment
- Herbicides
- Culture of host and native nectar plants
- Restoration

Again, methods are fairly predictable, with some variations driven by research results.



Fall mowing certainly reduces blackberries. It reduces the stature of Scot's broom, but not its abundance, so herbicides will be needed for real control.

Spring mowing has been shown to reduce tall oatgrass (note the three treatments marked by asterisks), and we started doing this outside of lupine patches this year.



In margins of butterfly sites, manual control of Scot's broom is needed. Much of this work is accomplished by “at-risk” youth crews.

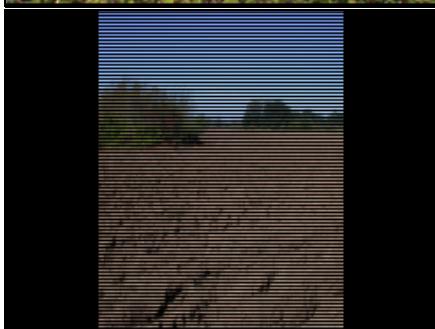


It is fairly straightforward to establish lupine seedlings directly in the field, if we have seeds. Seed predation is a problem in the wild, so we have established plantings in the nursery to provide a reliable source. We're also growing nectar plants for outplanting and as seed sources.

But where should we put these plants? We have only one site where the exotic grasses are low enough that we feel good about augmenting lupine. But a complete change in vegetation is needed at many sites.



Restoration starts with removal of existing vegetation.



In this protocol, we plow,



and grow a cover crop



then repeat till and irrigate to deplete weeds



We will then drill the native fine fescue, *Festuca roemeri*



And establish diversity, including Kincaid's lupine and native nectar species.



Responsible stewardship of these important sites is clearly a continuing challenge.

Unmet challenges are both biological and bureaucratic. For example, how do we manage the conflict between maintaining fire's function and its tendency to promote exotic components of the system? And how do we continue to meet our stewardship responsibilities in the face of changing budget and management priorities?