

Mining the Rockies for Plants

Things to consider

The Gore Range, 14,000 feet



Chester County , PA , 100 miles NW of
Philadelphia



Plants and Altitudes ,

What are you looking for?

1. Alpine Zone , 11,500 - 14,500 feet .

Corresponds to 66° latitude

2. Subalpine, > 10,000 ft , $60-66^{\circ}$

3. Montane , 8000-10,000 ft , $50 - 60^{\circ}$

4. Foothills, 6000-8000ft , $40 - 50^{\circ}$

5. High Plains, 4000-6000 ft, $30-40^{\circ}$

A 250' change in altitude is the same as a change of latitude of 1°

What you might find.
Alpine Zones ,
11,500'



Erysimum nivale

Subalpine ,
10,000'



Iris missouriensis

Montane ,
8000-10,000'



Potentilla hippiana

Foothills,
6000-8000'



Quercus gambelli

High Plains ,
4000-6000'



Acer grandidentatum

Some successful relocations particularly useful in the Midwest

Mahonia repens

Pinus aristata

Prunus virginiana
var. *melanocarpa*

Philadelphus lewisii

Populus deltoides

Rhus trilobata

Potentilla fruticosa

Alnus tenuifolia

Prunus besseyi

Salix irrota

Pinus flexilis

Picea pungens

Pinus strobiformis

Psuedotsuga menziesii

Abies concolor

Betula glandulosa



A lot of things don't fly , Some reasons why

1. Heat and Night temperatures

Day to night in Denver, Colorado , 100° F Day, 50° F night

Higher elevations , 80 ° F , day , near 32 ° F at night

2. East Coast

Philadelphia , day 100 ° F , night 85 ° F

we have no high elevations near Philadelphia

Results in massive physiological problems

#1 Unrelenting respiration ,



Potentilla Red Ace

Potentilla fruticosa Tangerine, Red Ace and Pink Beauty
all fade out in Philadelphia , sometimes die

Heat Stress Varies

- Some plants don't mind
- *Abies concolor*
- *Pinus aristata*
- *Pinus contorta latifolia*
- *Pinus flexilis*
- *Picea pungens*
- *Pinus strobiformis*
- *Pinus strobiformis* x *flexilis* hybrids
- *Psuedotsuga menziesii*
- Some plants do
- *Abies lasiocarpa*
 - (slow growing)
- *Picea engelmanni*
- *Pinus ponderosa*
 - (slow growing)
- *Pinus edulis* (dies over time)



Heat Stress and deciduous plants not a good mix ,

Family

Genus and species

Aceraceae

Acer grandidentatum , *Acer glabrum*

Cornaceae

Cornus canadensis

Eleagnaceae

Shepherdia canadensis

Grossulariaceae

Ribes americanum, *R. aureum*,
R. cereum

Hydrangeaceae

Jamesia americana

Ranunculaceae

Clematis ligusticifolia

Roseaceae

Holodiscus dumosus

Rubus parviflorus, *R. deliciosus*

Prunus pennsylvanica saximontana

Rosa woodsii, *R. arkansana*

Sorbus scopulina

Giving soils some thought

Colorado soils vary with altitude, mountains formed from two different methods



East

Acidic, worn down mountains
poorly drained
lots of natural precipitation
low in Ca and Mg
Mycorrhizal associations differ
from Western soils

10,000' , 6000'

vs



West

Alkaline , old ocean bottom, volcanic actions
sparse amounts of ambient water
high in Na, Ca and Mg
high in other salts , heavy metals ,
Mycorrhizal associations differ from Eastern soils.

Why do Western Species have disease problems in the East ?

1. No selection pressure to evolve defensive strategies
2. Stress problems due to environmental changes
3. Natural adaptations to the West , such as silver gray leaves, innate water storage mechanisms
4. Sensitivity to soil drainage problems , lack of soil oxygen
5. Soil pH problems and nutrient imbalances
6. Light levels inadequate in comparison to natural environments

Disease comparisons

- **Foliar diseases of the East**
 - Black Spot on Roses
 - Fireblight (Erwinia sp)
 - Phytophthora(Aerial forms)
 - Botryospheria
 - Botrytis
 - Mildews , Downy & Powdery
 - Cedar Apple Rusts
 - Rusts otherwise
 - Dipolida
 - Phomopsis/Kabatina
- Foliar disease of the West
 - Erwinia



Low light levels : A new headache for Western Species

Western plants evolved at 1000's of feet above the typical near sea level environment of the East

Light intensities are significantly reduced, bright light in the East is akin to shade in the West .

Light quality is also reduced with subsequent reductions in blue and ultraviolet light

Some symptoms

Slow growth, such as in *Populus deltoides* and *Pinus ponderosa*
failure to grow , *Jamesia americana*
little or now flowering or fruiting , *Cactus* , *Rosa woodsii*

What about Fall and Winter?

Summers in the Rockies , Hot and Dry day , cool and dry night

Summers in the East , hot and dry during the day,
hot and often wet during the night, not only from rain,
but heavy dew and fog

Fall in the Rockies, Rapid change from day to night , Snow possible on
the last day of summer , frost certainly in Sept.

Fall in the East, Slow change from day to night . Snow not possible till
late December if then , frost mid Oct or later .

Winter in the Rockies, could come at anytime after summer, Fall often \
short , quick shift to cold temps, snow prominent but not long lasting

Winter in the East, prolonged Fall, followed rapid shift , Snow long
lasting , cold rain and ice constant problems,

How introduced plants react to the East

- **East Coast Natives**
- Dormancy based on photoperiod or draught
- Dormancy unaffected by rains
- Cold wet pathogens become active, but most natives generally resistant
- **Rocky Mt natives**
- **Dormancy not directed by light levels, Plants weak due to low light experiences**
- **Rain and heavy dew/fog disrupts dormancy**
- **Dormancy delayed or impeded or hindered by warm night temperatures**



Propagation Concerns for Western Plants

1. Many natives can be propagated under mist
Sambucus, Lonicera, Philadelphus, Salix, Populus
and Potentilla handle mist with ease

2. Grey leaved , pubescent plants have much
bigger problems. They rot! *Artemesia tridentata*,
Krascheninnikovia lanata (syn. *Eurotia*) and
Holodiscus are some examples ,

Green leaved plants such as *Rubus*
deliciosus and *Purshia tridentata* also resent mist

For the latter Nearing Frames or high humidity
chambers without mist prove to be effective for
some things.

Propagation by cuttings

Substrates

- 1. Pure perlite**
- 2. Rock Wool**
- 3. Crushed Volcanic Rock**

Advantages , well drained , maximum Aeration

Disadvantages , Coarse poorly developed root systems , roots are brittle , hard to handle and hard to transplant.

By adding as little as 10% peat most an effective compromise can be achieved .

Propagation by cuttings , other considerations

Degree of hardness varies from West to East, timing is different ,Soft cuttings may well rot , harder cuttings may not root.

Hollow stemmed cuttings present a special problem with rotting.

One remedy is to seal the basal end with wax and wound along the side .

Juniperus scopulorum and others won't root generally but can be coaxed into action with 1ppm 2,4-D added to a liquid dip. Not gospel but worth a try sometimes.

Seedling ,.



Note trays raised
above floor to allow
for aeration and
disease control

Damp off is a constant problem

One solution is to use steam
sterilized soils, remember no real
immunity to East Coast pathogens

Use very well drained soils and
square plugs,

Shy away from Vermiculite, holds
too much water

Water carefully by hand or
sparingly by mist, or from the bottom

Extra care for gray leaved plants

Container production

#1 factor for containers with Western species, Drainage , Drainage
Drainage , and then Drainage

Drip is preferable to overhead , limiting foliar diseases

Grow plants in open sided greenhouses with a clear plastic roof
limits the amount of damage a week of rainy weather can do

Ease up on fertilization , too much fertilizer requires lots of extra
water

Watch for pH problems by water being too acid , classic symptom
plants won't grow inspite of fertilizers.

In The Landscape



Protection from rain and heavy dews is all but impossible
Drainage key word here too, raised beds , berms, and French drains
effective

Soil mix important , establishment in endemic soils very hard to do

Use a prepared mix of sand, some organic matter and crushed rock
2- 1- 2 helpful.. Amend with Calcium and Magnesium , Dolomite
especially useful . Keep an eye on pH due to acid water

Disease Control

Preventative fungicide sprays , especially those with heavy metals

Do not water at night

Limit overhead watering, drip or capillary watering best

Discontinue mist cycles at night and on foggy or cloudy days

Use Nearing Frames or high humidity chambers in lieu of mist

Custom make soils if necessary

Making the transition work, What to do with a new plant?

Take a trip , study the plant in the wild if possible, take notes and lots of pictures .

Call Mike Bone , his cell # is

Does the plant grow at the top of the slope or the bottom

Does the plant occur on the North Slope or the South Slope?

Feet in water? Near water ? No where near water (most likely)

Indicator rocks, such as ones with Selenium or Pyrite or Mica

What are the associate plants ?

When does seed set occur ?,

Best Method for Introduction to a new world

Get the facts , Mame , get the facts

Use seed from a reputable dealer or collector , we are out there

Collect seed yourself , but know your plant and know about the necessary permits and so forth needed by the good folks at BLM

Shipping back whole plants is trouble . They resent warm, dark boxes . Cuttings by FedEX next day or Express Mail best .

Expect failures !!!! Fritz happens. Try again

Work with the survivors . Be patient and diligent , and remember drainage , drainage , drainage.