UPPER SITE PROJECT COMPONENTS

Upper site existing condition

In the subsequent booklet sections, the Upper site project components will be described (following French Gulch Creek from the water treatment facility and backcountry towards Dead Elk Pond). Each component strategically integrates historic dredge rock spoils strewn across the valley floor in order to conserve onstie materials. The dredge rock is not only part of the cultural landscape, but it exists in abundance. Each design component attempts to make use of the dredge rock for spatial, functional, and ecological purposes.

The Upper site project components, descending in elevation, and numbered on the site plan below:

A. Water Treatment Plant
B. Upper Wetland Basin Filters
C. Dry seed catcher
D. Community Use Zone
E. Wet seed catcher

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PROJECT A

Water Treatment Plant

The Wellington-Oro water treatment plant was completed and activated in November 2008. It treats water discharging from the abandoned Wellington-Oro silver-zinc mine and is expected to remove cadmium and zinc from drainage entering French Creek at the mine site, resulting in improved water quality in the creek and an improved brown trout fishery in the Blue River. The plant is designed to treat a maximum of 150 gallons per minute and will operate 24 hours per day, seven days a week. It will remove more than 90% of cadmium and more than 99% of zinc from the mine drainage resulting in significantly lower concentrations of dissolved metals in the Blue River downstream of French Creek. Vancouver, B.C. based BioteQ designed and engineered the new treatment plant. The BioteQ process for water treatment and metal recovery, which uses sulfide precipitation, was selected as the best technology to remove dissolved cadmium and zinc from mine drainage at the Wellington-Oro site. This method was selected because of its ability to remove metals from the water for refining and recycling and produce treated water that meets strict water quality criteria. The efficacy of the treatment plant will be monitored in the following years.

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PROJECT B:

Upper Wetland Basin Filter

Due to the intensive historic placer dredge mining, French Gulch valley is literally turned upside-down. The waste piles of rock remain on top of the stream beds. Criss-crossing underneath, the streams reach daylight sporadically. Even in this extremely disturbed and restrictive environment, portions of the streams actually support some vegetative and animal life at their edges. Upstream, where the dredge mining never reached, some native wetland/stream/pond mixtures remain intact and in very good health (see image, right). These rich environments support the greatest diversity of aquatic and terrestrial life in the area. Because intact wetland communities are strung in a necklace along the same creek as our site, we can expect ample seed source to be traveling with the water flow downstream. For this reason, the wetland basins in the reclamation design are structured and prepared to accept seeds, thus allowing pioneer plants to colonize the wetland edge habitats.

Wetlands, the West, and Mining Sites

Given the permanent need for wetland banking in the United States, mined sites are optimal for constructing new wetland acreage. Constructed wetlands have proven to be effective passive treatment options for removing some contaminants.Repairing wetland and riparian areas in the West is critically important due to their ecological value. It has been estimated that 1 percent of the riparian habitat of the American West remains intact[1] , yet 75 to 80 percent of all species in these arid ecosystems depend on that habitat[2]. The diversity of ecological services performed by wetlands argues for their inclusion and expansion in reclamation projects with the appropriate conditions.

Western water law establishes ownership of water rights and states that newly constructed wetlands are consumers of water. Thus, the construction of wetlands is constrained to the acreage of wetlands lost due to the reclamation activities. In order to construct additional wetlands, the right for the water used by the wetland through evaporation and plant uptake must be obtained.

1 Knopf, F., Johnson, R., Rich, T., Samson, F., and Szaro, R. "Conservation of riparian ecosystems in the United States." Wilson Bulletin 100 (1988): 272–84.

2 Gillis, A. "Should cows chew cheatgrass on common lands?" BioScience 41.10 (1991): 668–75.

Upstream Intact Wetlands
In upper French Gulch, beyond the mining disturbed areas, alpine wetlands thrive in a healthy condition. These areas would provide source populations for any reclamation activities downstream.

B. UPPER WETLAND BASIN FILTER

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Upper Wetland Basin Filter

earthwork

topsoil and water

seeding

maturation

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PROJECT C:

Dry seed catcher ecology

The entire cross-section of the upper valley is dominated by the 30' high dredge tailings left by the historic placer mining operations. Largely due to lack of topsoil and resultant lack of moisture retention for root establishment, this portion of the site has remained un-colonized by vegetation. To remediate this situation the reclamation design will insert soil deposit mattings, impregnated with native seed sources, in key areas to catalyze vegetative growth. As they mature, the seed catcher design elements make subtle adjustments to environmental gradients to build a vegetative colony and rich habitat. The dry seed catcher is configured as sculpted ridges and valleys made out of existing dredge rock. The valleys are oriented to form protected microclimates and low points with additional moisture from snowmelt. This moisture will assist the growth and establishment of vegetation that will be introduced by voluntary and involuntary planting methods. Over time, a vegetated edge will develop with a mix of evergreen, deciduous, and grass species. The edge will define the Wellington neighborhood's boundary as users travel up French Gulch Road toward the back-country.

Dry seed catcher programming

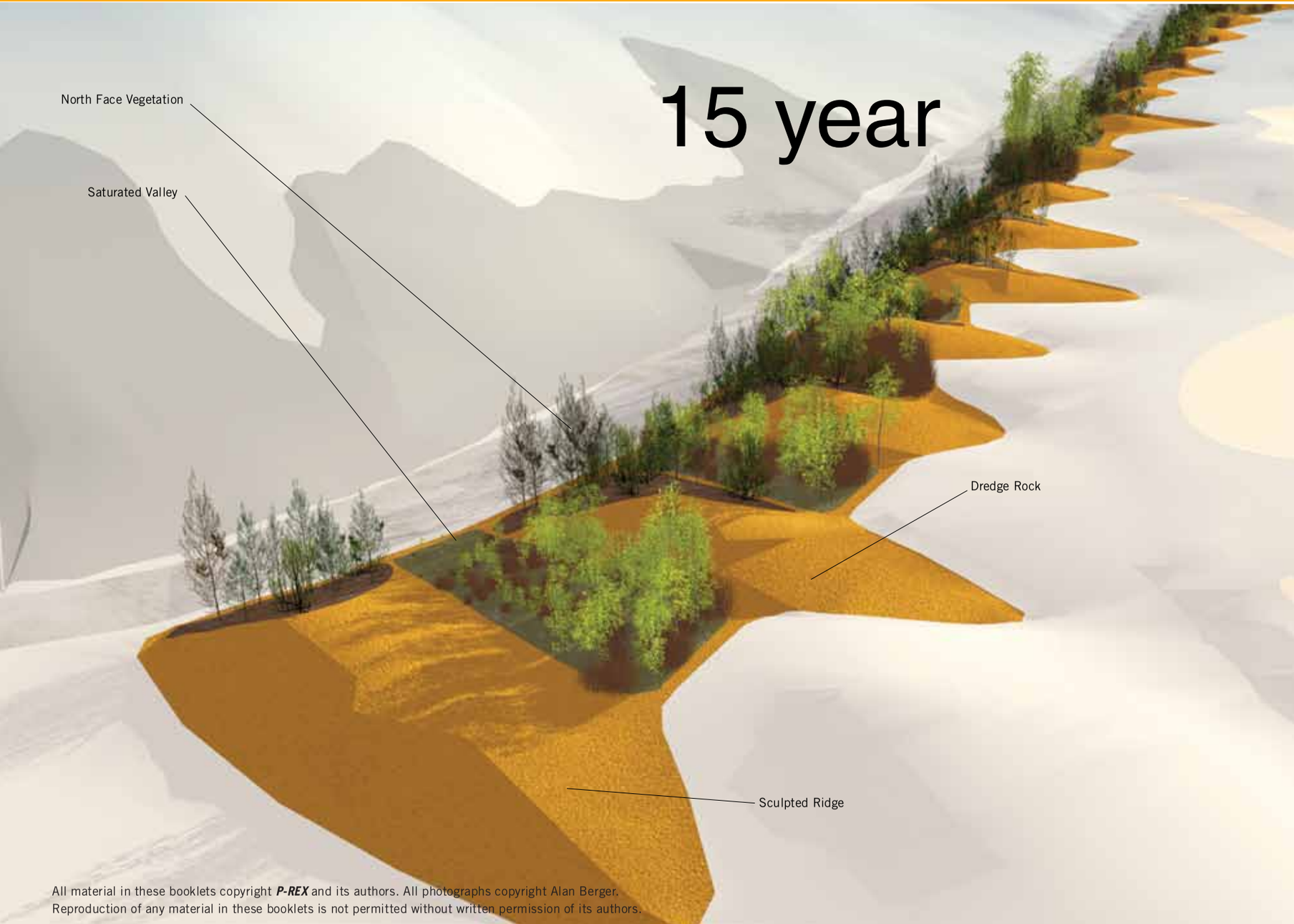
In phase I portions of the dredge rock tailings are moved and regraded into the ridge and valley system seen in the perspective. In phase II, the soil and seed mattings are emplaced in the valleys over a gravel drainage layer. The soil strata will be 18"-36" deep, with tree areas protected from erosion by gabion structures. There is great potential for the required organic material to be harvested from lodgepole pines killed from the devastating pine beetle infestation throughout the region. Additional research for making a custom soil blend from pine mulch should be a priority, as the potential for a cheap, plentiful, local recycled organic material could supply all of the project's topsoil needs.

A trailhead leading from French Gulch Road into the wide interior valley floor area should be marked and designed into one of the dry seed catcher valleys. In the winter, groomed and ungroomed hiking and cross country skiing trails can be maintained in and around the seed catchers along French Gulch Road.

base

5 year

10 year



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PHASING:

Dry seed catcher system programming

existing

dredge rock regrading

soil and seeding

maturation

winter

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PROJECT D:

Community Use Zone

At the upper edge of the Wellington neighborhood, a 1 acre community use zone is carved out of the dredge tailings. The area is designed as a neighborhood park, rather than as a public meeting place like Dead Elk Pond's Activity Green. A flattened area can be used for performances, sports, and other active and passive gatherings. A small amphitheater will be "sculpted" into the toe slope of the dredge rock ridge lying uphill from the community park. This design element should be constructed from local dredge rock and gabions structures, and inset in the slope at an orientation to maximize solar exposure and melting of snow on the sitting surfaces. A trailhead for linking into the backcountry trail system and a few car parking spaces should also be located in the area. During cold weather months the dredge rock ridge will be used for sledding and snow recreation. The community park's flat surface is an ideal landing zone for sledding down the dredge rock ridge. During warm weather months Wellington neighborhood residents have flexibility to activate the park and amphitheater with social and cultural events.

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PHASING AND PROGRAMMING:

Community Use Zone

The perspective views reveal how land surfaces in the community park can be programmed for diverse uses. Its design takes advantage of the topographic change provided by the dredge tailings to form an environment entirely unique to this area. The regraded dredge provides roughly 16' of vertical difference between the community park floor (El. 9770' above sea level) and the overlook platform.

As topsoil becomes available, the community park will be seeded with wildflower meadow mixes over most of the flat area. The meadow will be seasonally mowed (after seeding, but in proximity to peak warm season activity months) and harvested for seed source to use elsewhere in the valley. Taller, more mature vegetation should be planted to provide spatial definition and protection from the elements where people gather, such as in children play areas that may be built in the future.

existing

earthwork

topsoil

seeding

maturation

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Overlook Platform and Ramp

The overlook platform is located at the top of the Wellington neighborhood. It is accessed along the overlook ramp pathway, which connects the high ridge of dredge rock to the community park. Inclining upward from the community park, the ramp pathway marks an important transitional zone between the neighborhood's more cultivated and manicured landscape and the untamed, indigenous backcountry landscape up the valley. The platform is oriented to the west taking advantage of distant views to 12,000'+ peaks across the valley. The platform should be constructed of heavy, durable slab material to create an experiential and tactile difference from the connected crushed rock path system. Sitting areas and other amenities should be situated to maximize the down valley views.

existing

reclaimed

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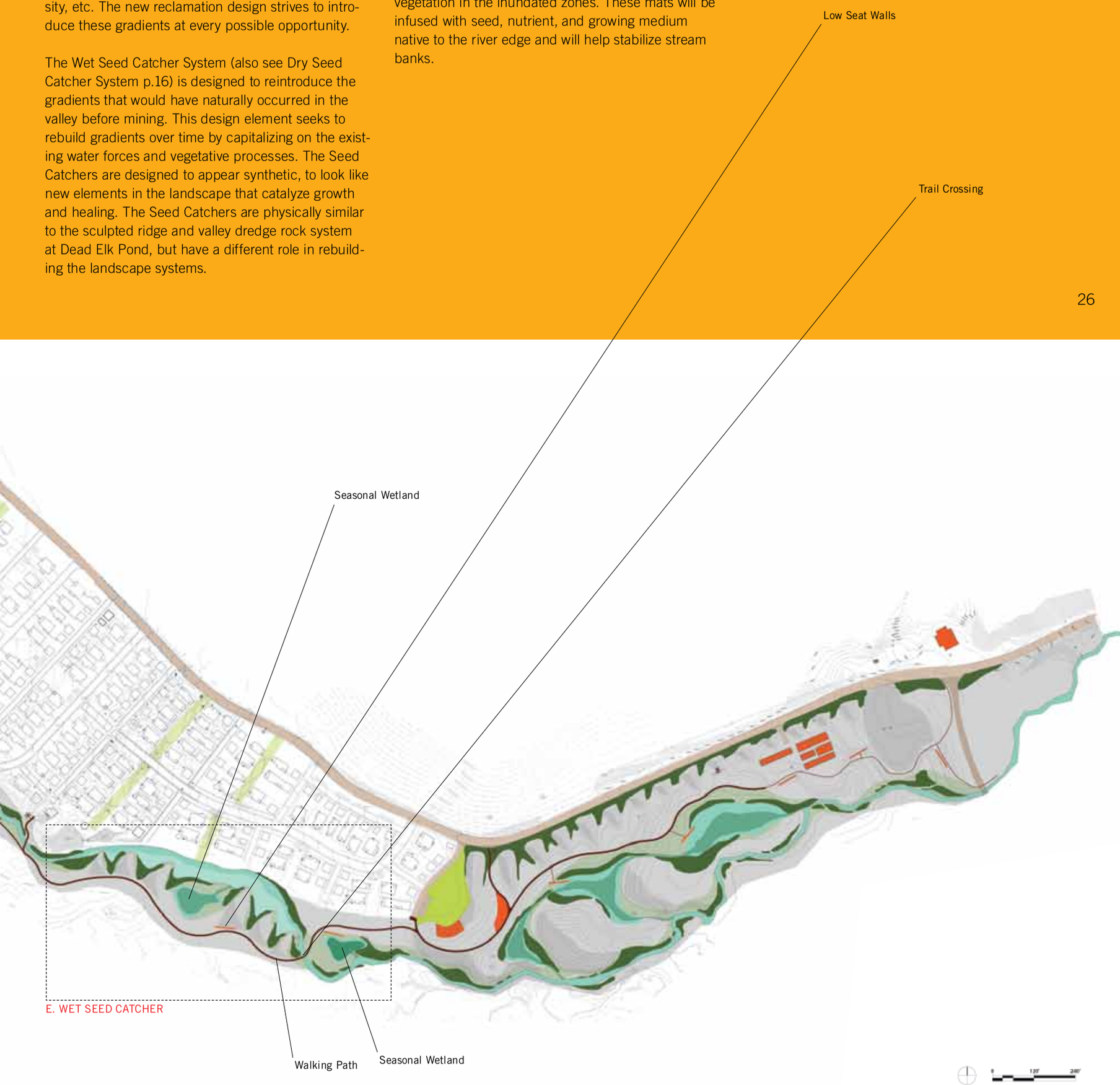
PROJECT E:

System

One of the most significant impacts of mining on the environment is straightening the edges of natural systems that flow through the environment in complex patterns. This complexity is often formed as a result of underlying forces that shape an ecosystem over long periods of time. For example, water bodies that flow in meandering patterns are often the result of underlying geology or physical barriers preventing the water from flowing straight. The meandering pattern increases surface area for water and land to intermix, thus resulting in more complex dry to wet gradients over the length of the water body. More gradients lead to more diverse habitat, which results in more biodiversity, etc. The new reclamation design strives to introduce these gradients at every possible opportunity.

The Wet Seed Catcher System (also see Dry Seed Catcher System p.16) is designed to reintroduce the gradients that would have naturally occurred in the valley before mining. This design element seeks to rebuild gradients over time by capitalizing on the existing water forces and vegetative processes. The Seed Catchers are designed to appear synthetic, to look like new elements in the landscape that catalyze growth and healing. The Seed Catchers are physically similar to the sculpted ridge and valley dredge rock system at Dead Elk Pond, but have a different role in rebuilding the landscape systems.

In the Wet Seed Catchers, the ridge and valley piles will be placed at the edge of French Creek, a riparian stream corridor. The dredge piles will alter the hydro-dynamics to encourage deposition of upstream sediment, which will accumulate small point bars during high flow periods. In low flow periods, these bars will accumulate seed from rich upstream wetlands and pioneer plants will colonize the edge habitats. Gabion structures will be added to armor the dredge rock ridges in areas of maximum turbulence and water movement. Bare-root plantings are spread along the edge to accelerate sediment deposition. If necessary, commercial seed mats could be installed to establish vegetation in the inundated zones. These mats will be infused with seed, nutrient, and growing medium native to the river edge and will help stabilize stream banks.



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PHASING:

Wet Seed Catcher Ecology

base

5 year

10 year

Colonizing Vegetation

Wet Seed Catchers

15 year

Colonizing Vegetation

Wet Seed Catchers

Dredge Rock

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