The Choice and Siting of Natural Vegetation in Reclamation of Disturbed Land

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The choice and siting of natural vegetation in reclamation of disturbed land

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Introduction It is often desirable , or required by law , to reclaim disturbed land with natural vegetation . In the steppes of the world this involves large areas disturbed by cropping , marginal cropping (CRP) , road building , and mining . For example , in Montana's 365 thousand square kilometers of steppe--environmentally comparable to adjacent states and Mongolia--these disturbances are currently 14% , 0 .6% , 0 .6% and 0 .01% respectively and with energy development un-paved roads and mine/ gas sites are increasing .

We suggest that the best natural reclamation targets are the communities that occupied the site before its disturbance . And that these communities will establish best if they are seeded into landscape units ecologically equivalent to those they occupied before disturbance . Methods for application are tested .

Methods Our data base came from points surveyed by the Absaloka mine , Hardin MT as one requirement for acquiring coal mining permits . At each of 840 pre-disturbance sites , plant species were listed (with estimates of their percent cover) and presumptive landscape factors/variables were measured , i .e . topography (egg bottom , slope , ridge) , configuration (convex , straight , concave) , slope and aspect , and soil (clay and rock%) .

Target vegetation types were identified with three tools : ordination (to relate all samples one-to-another) , classification (to provide a hierarchical grouping of samples) and pruning analysis (to determine an optimal number of types) .

The correlation of each of the eight pre-mine vegetation types with landscape factors was calculated/ presented by three methods . The vegetation types were logistic regressed against landscape factors . The vegetation types were CART regressed against landscape factors . And after identification of the primary factors , the presentations were simplified by plotting calculated occurrence on axes in a space defined by those factors , i .e . by plotting actual observations , probability of presence (logistic regressions) , and most likely community (CART) .

Results and conclusions Ordination , classification , and objective pruning objectively identified eight pre-disturbance natural communities appropriate for the mine's post-disturbance landscape . The best sub-optimal alternative community numbers were five and sixteen . A summary releve table characterized and compared the communities by listing all the species present , their constancies (% of stands in a type in which the species appeared) , and their percent ground cover . We suggest that that seed mixes should contain most of the high to moderate constancy species , no exotics , and in amounts consistent with reestablishing the original cover levels .

Siting by logistic regressions , CART regressions , and graphical models was compared . CART carpets a site with the single most probable [best'] community for each landscape facet . The logistic regressions provide a basis for calculating the probability that any vegetation type will occupy any facet of the site . Thus they offer more flexibility to engineers by presenting alternatives which may be nearly as likely to establish and perhaps more satisfying with respect to other criteria including aesthetics , rarity of species , and forage quality . We also favor the logistic models because they have more regional generality , i .e . because they can be more validly extrapolated to areas with slightly different climate and soils . After the identification of primary controls (correlates) it is desirable to simplify application of the regressions by use of graphical models .

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