

## **APPENDIX F: Animas - La Plata Mitigation Program Wetland/Riparian Vegetation Monitoring**

### **EXECUTIVE SUMMARY**

The Animas-La Plata (ALP) Project wetland/riparian mitigation program commitments specify certain levels of vegetation treatment (weed control) and re-establishment (planting) to correct the damaged wetland/riparian vegetative community in the wetland/riparian portion of the Mitigation Area (MA). To monitor the progress of Reclamation's vegetation management efforts, the following vegetation monitoring methodology has been implemented and will be employed throughout the mitigation program to ensure that Reclamation's vegetation goals are met. The methodologies employed are a slightly modified Daubenmire box plot-transect method and a slightly modified Breeding Biology Research and Monitoring Database (BBIRD) vegetation measuring protocol oriented along the Daubenmire transects.

Forty transects were established in 2002 with 20 by 50 centimeter box plot readings taken every 5 meters and two BBIRD 11.5 meter nested plots taken on either side of the La Plata River centered approximately 15 meters from the centerline of the current alignment of the river on each transect. The first measurements were taken in August and September of 2002 and will be repeated in the spring and fall of each year until mitigation objectives are met. Thereafter periodic repetitions will be completed on an approximate five-year cycle to ensure maintenance of the vegetative integrity of the wetland/riparian areas of the MA.

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## **METHODOLOGIES**

The following describes Reclamation's established methods for sampling vegetation in riparian forest, shrub, and meadow habitats. These are modified versions of the Daubenmire and Breeding Biology Research and Monitoring Database vegetation measuring protocol. Both of these methods use the same transect line but are measured independently from different points of origin on each transect. Transects were initiated randomly from the northern boundary of the MA on the tract of land referred to as Tract III within the La Plata River Valley bottom. The transects run from canyon wall to canyon wall from east to west and are 200 meters apart (north to south) as measured by pacing. In general, vegetation is divided into three strata (A, B and C) which represent the herbaceous and low-dense shrub growth forms, the scrub-shrub intermediate growth forms/stages and the tree/canopy layer respectively.

### **DAUBENMIRE METHOD**

The Daubenmire method consists of systematically placing a 20 x 50 cm quadrat frame along a tape on permanently located transects. The Daubenmire method is used to quantify the vegetative attributes of canopy cover below 1 meter, frequency of species occurrence and the composition by species of the canopy cover below one meter. This method is applicable to a wide, variety of vegetation types as long as the plants do not exceed waist height. To accommodate plants over waist height in this method, the box plots are each accompanied by a convex densiometer reading taken from the south side of the box plot facing north.

The linear technique of transect establishment was the one used for this study. The starting points of each transect were permanently marked and recorded with GPS. General photo points were taken at each transect start to qualify the data taken.

This method is relatively simple and rapid to use. A limitation is that there can be large changes in canopy cover of herbaceous species between years because of climatic conditions, with no relationship to the effects of management. Therefore multiple years of data and seasonal data (spring versus fall) will have to be collected to ensure the integrity of the data collected. The data are recorded in hard copy and digital formats using standard Daubenmire forms and digital spreadsheets. This method typically uses six separate cover classes. The cover classes are displayed below in Table 1.

TABLE 1:

| Cover Class | Range of Coverage | Midpoint of Range |
|-------------|-------------------|-------------------|
| 1           | 0 - 5%            | 2.50%             |
| 2           | 5 - 25%           | 15.00%            |
| 3           | 25 - 50%          | 37.50%            |
| 4           | 50 - 75%          | 62.50%            |
| 5           | 75 - 95%          | 85.00%            |
| 6           | 95 - 100%         | 97.50%            |

Reclamation has opted to employ the modification of a 21-cover class system due to the level of data control and detectability needed to meet mitigation objectives. See Table 2, below.

TABLE 2:

| Cover class | Range starting point | Midpoint |
|-------------|----------------------|----------|
| 1           | 0%                   | 2.50%    |
| 2           | 5%                   | 7.50%    |
| 3           | 10%                  | 12.50%   |
| 4           | 15%                  | 17.50%   |
| 5           | 20%                  | 22.50%   |
| 6           | 25%                  | 27.50%   |
| 7           | 30%                  | 32.50%   |
| 8           | 35%                  | 37.50%   |
| 9           | 40%                  | 42.50%   |
| 10          | 45%                  | 47.50%   |
| 11          | 50%                  | 52.50%   |
| 12          | 55%                  | 57.50%   |
| 13          | 60%                  | 62.50%   |
| 14          | 65%                  | 67.50%   |
| 15          | 70%                  | 72.50%   |
| 16          | 75%                  | 77.50%   |
| 17          | 80%                  | 82.50%   |
| 18          | 85%                  | 87.50%   |
| 19          | 90%                  | 92.50%   |
| 20          | 95%                  | 97.50%   |
| 21          | 100%                 | 100.00%  |

As the quadrat frame is placed along the tape at the specified intervals, canopy coverage of each plant species or species group. Data is recorded by quadrat, by species (or species group), and by cover class on the Daubenmire form. Canopy coverage estimates are made for both perennial and annual plant species. Overlapping canopy cover is included in the

cover estimates by species; therefore, total cover may exceed 100 percent. Total cover may not reflect actual ground cover.

Reclamation calculates the percent canopy cover by species (or species group) and the percent frequency for each plant species by dividing the number of occurrences of a plant species (the number of quadrats in which a plant species was observed) by the total number of quadrats sampled along the transect and multiplying the resulting value by 100. Species composition is based on canopy cover of the various species/groups and is determined by dividing the percent canopy cover of each plant species by the total canopy cover of all plant species.

Reclamation has lumped herbaceous species into desirable versus non-desirable categories as well as a wetland indicator species due to the specific weed control objectives. Coverages for specific weed species are noted, but the overall weed coverage is the determining factor in the mitigation goals and is therefore the primary measurement of concern in this study.

The established transects are the sampling unit in this portion of the study, not the box plot. With the transects treated as the sampling unit, and given that the transects are permanent, either the paired t-test or the nonparametric Wilcoxon signed rank test will be used to test for change between two years. Repeated measures ANOVA can be used to test for differences between 3 or more years.

## **BBIRD METHOD**

Systematic vegetation measurement plots were established and accomplished with 2 per transect to establish the baseline primary vegetation type of the plot. These plots were established in pairs centered along the Daubenmire transects at 15 meters from the centerline of the La Plata River to both the east and west. A total of 80 systematic vegetation plots were measured over the 40 study transects. Vegetation measurements were accomplished according to the BBIRD Field Protocol (Martin, et al, 1997) with modifications to account for the distinct low dense shrub vegetative types and the general lack of grasses and forbs within some portions of the study plots.

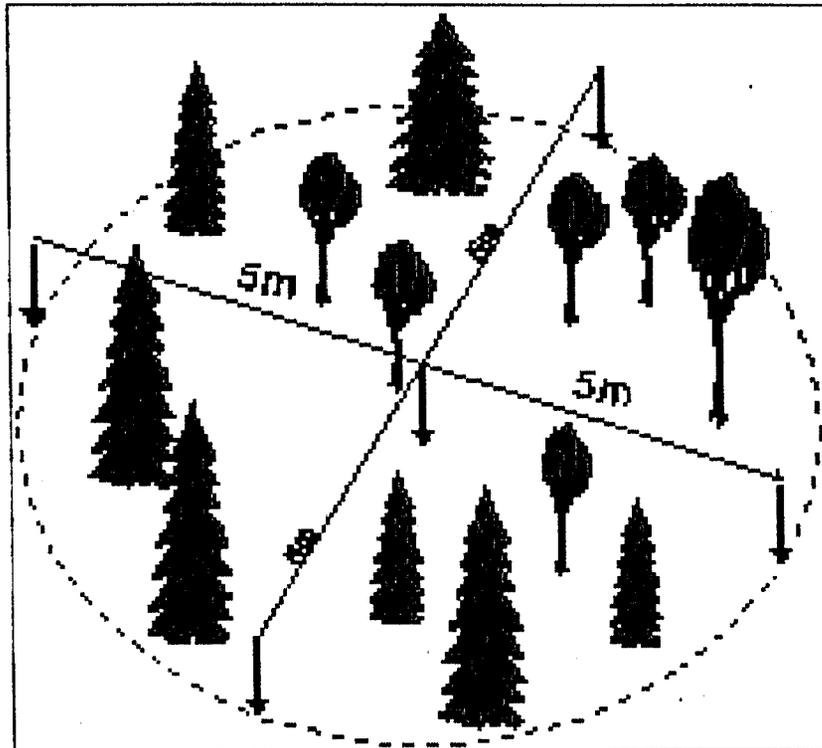
Five-meter radius circles were identified first and stem counts for vegetation over 50 centimeters in height and less than 8 centimeters diameter at breast height (DBH) were counted by species. Percent dead ground cover is described by brush, litter, log, bare, forb, shrub, water. Percent live ground cover included measurements for percent live ground cover developed from percentages of grasses, forbs, weeds, cacti and marsh vegetation. Litter depth was also measured and averaged. Canopy height, slope, aspect and canopy cover percentage was also measured. An additional 11.3-meter circle was established around the 5 meter one and tree counts (by species) for small (8 – 15 CM), medium (15-26 CM) and large (> 26 CM) DBH trees were made. Both large and small snags were also counted.

## SETTING UP A BBIRD SUB-PLOT

At monitoring sites, two sizes of circular plots are established: 1) a plot of 5 meter radius that is used to count shrub and sapling stems and measure ground cover, and 2) an 11.3 m radius plot that is used to count the stems of trees. The 5 m plot is nested within and centered on the same point as the 11.3 m plot.

Plots were divided into quadrants to facilitate stem counting (see Figure 1, below).

*FIGURE 1: 5 METER VEGETATION PLOT*



### MEASUREMENTS MADE AT/FROM THE CENTER OF VEGETATION PLOTS

The following measures are taken while standing at the center of the plot. Note that these measures are divided into two groups. The measurements are taken at all plots used to systematically describe the vegetation. First, the following variables are measured: Average top canopy height, percent total canopy closure, percent total canopy cover above 5 m in height, plant species that dominates the high canopy, percent of high canopy present that is occupied by the dominant species, plant species that co-dominates the high canopy and the percent of high canopy occupied by the co-dominant species.

### MEASUREMENTS TAKEN WITHIN THE SMALL (5 METER) PLOT

The following are the measurements to be taken within the 5 meter radius plots. All measurements are taken for all vegetation plots. One measurement taken is a count of the

numbers of stems of shrubs and saplings that exist within the plot circle. The number of stems of each species are counted for each of two size classes (<2.5 cm diameter or >2.5 cm diameter). Separate counts are made of the number of stems of each species of shrub/sapling within the plot.

In each of the 5m plots we also measure the depth of organic litter, using a stake or other tool (meter stick, ruler) to dig a small hole down to where individual leaf parts are no longer visible (leaf veins usually decompose last). We are interested in the depth of leaf litter and partially decomposed organic matter that accumulates on top of the mineral soil. Litter depth is measured at 2 m intervals from the center-point of the plot in the cardinal directions.

The final classes of vegetation measurements made within the 5 meter plots are estimates of ground cover of several types. The primary is the percent of the ground covered by green vegetation from 50 cm above ground, to ground level. For each class of vegetation (shrub, grass, fern etc.), an estimate a percent cover value independent of all other vegetation types is made.

Reclamation has also recorded other variables to be measured within each 5 meter plot, starting with the direction the 5 m plot faces in degrees. Next, the slope across the 5 m plot from the bottom to the top of the plot in degrees, organic litter depth, species of shrub encountered in the 5 meter plot, the number of small (<2.5 cm diameter) diameter stems of each species found within the plot circle, the number of large (2.5 -- 8 cm diameter) diameter stems of each species found within the plot circle, percentage of ground covered by green vegetation that is below 50 cm in height, percentage of ground covered by grasses below 50 cm in height, percentage of ground covered by weedy grasses (downy brome) below 50 cm in height, percentage of ground covered by sedge and rush species that is below 50cm in height, percentage of ground covered by woody perennial plants that are below 50 cm tall, percentage of ground covered by small dead woody vegetation (i.e. dead shrubs and bramble) less than 50 cm above the ground percentage of ground covered by broad-leafed non-woody, non-noxious weed plants below 50 cm height, percentage of ground covered by broad-leafed non-woody plants on the Colorado Noxious Weed List below 50 cm height, percentage of ground covered by moss, percentage of ground covered by cactus that are less then 50cm tall, percent of ground covered by leaf litter, percent of ground covered by downed logs (logs >12 cm diameter), percentage of ground covered by rocks (mineral substrate, the pieces of which are larger than 10 cm diameter sized), percent open ground not covered by leaf litter, percent of ground covered by standing or flowing water, percentage of ground covered by emergent marsh vegetation (vegetation undifferentiated by species or type that is growing in water).

#### MEASUREMENTS TAKEN WITHIN LARGER (11.3 METER) VEGETATION PLOTS

The 11.3 meter radius plots are used to count the numbers of trees near the center of the vegetation plot. Live trees are separated into the size classes given in the table, below. Separate counts should be made for each species of tree in the plot. Snags (dead trees) taller than 1.4 m and >12 cm DBH are be combined in a single category.

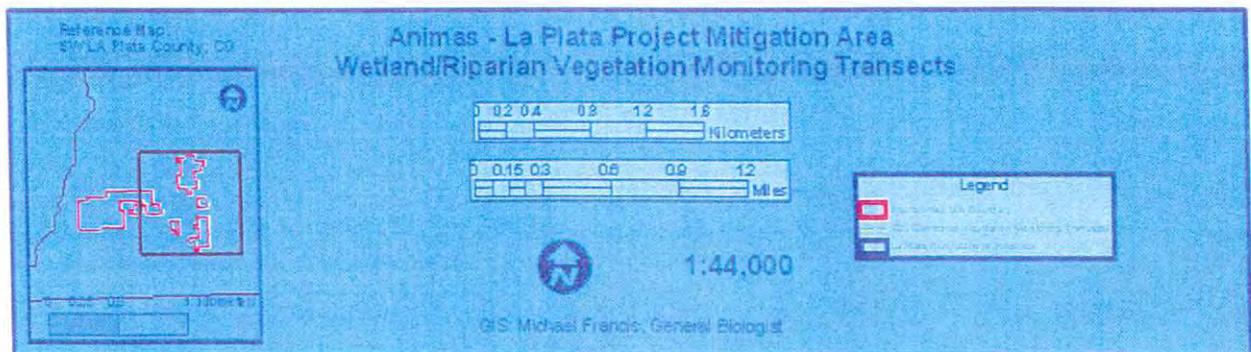
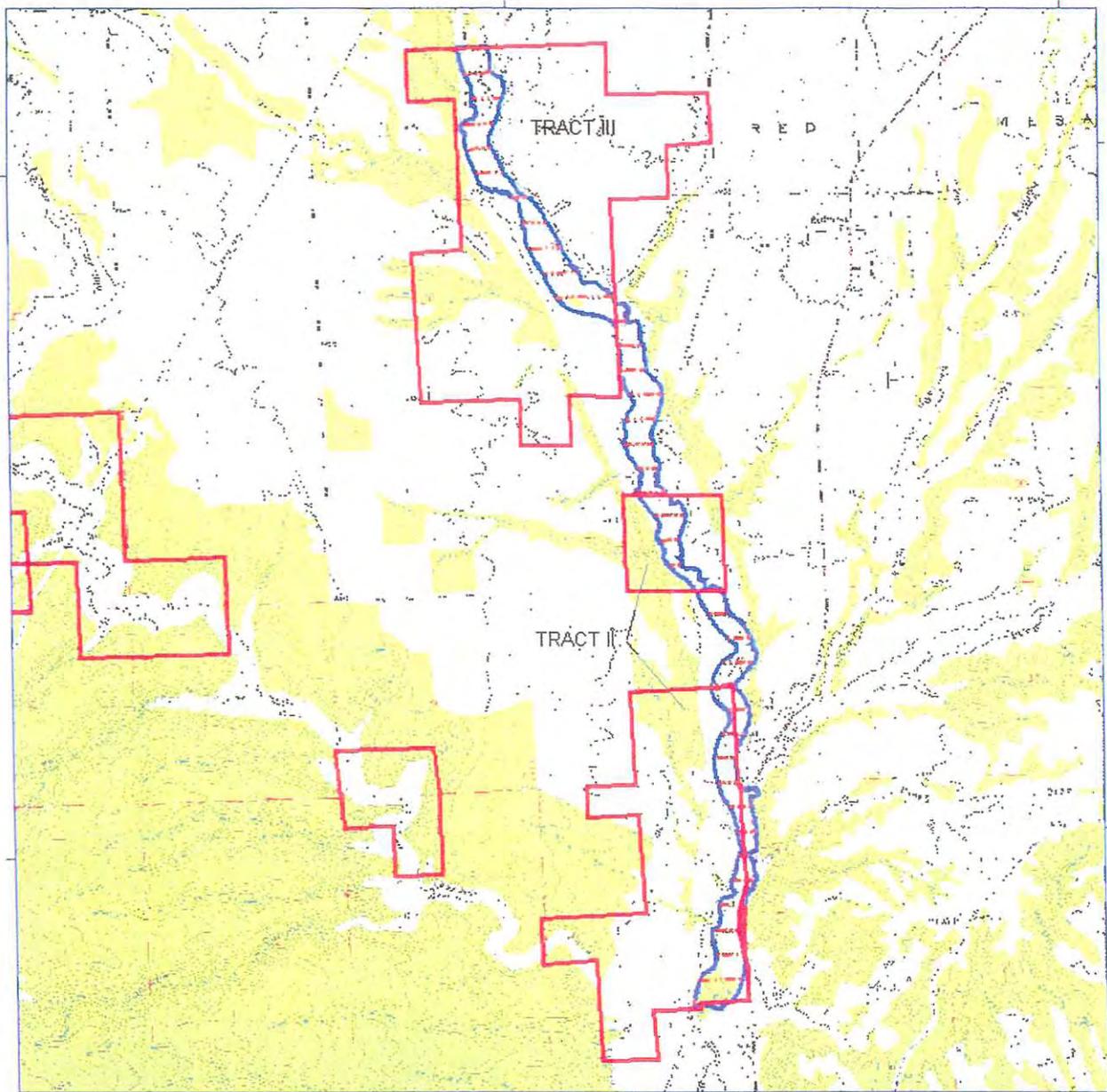
TABLE 3: TREE SIZE CLASSES

|                                  |   |
|----------------------------------|---|
| Live Trees (measured separately) | Small trees: 8 -- 23 cm dbh<br>Medium trees: 23 -- 38 cm dbh<br>Large trees: >38 cm dbh |
| Snags (combined all species)     | Small snags: < 12 cm dbh and > 1.4 m tall<br>Medium snags: > 12 cm dbf and > 1.4 m tall |

The following are the variables recorded for each of the large diameter plots: Species of tree encountered on the large vegetation plot, number of live stems of 8 -- 23 cm DBH per tree species, number of live stems of 23 -- 38 cm DBH per tree species, number of live stems of >38 cm DBH per tree species, number of snags (all species combined) less than 12 cm DBH and number of snags (all species combined) greater than 12 cm DBH.

ADDITIONAL MEASUREMENTS FOR MEADOW/MEADOW MARGIN HABITATS

Measuring desirable herbaceous species height is also accomplished where meadows or meadow margins enter the BBIRD plots. The actual average height of desirable herbaceous vegetation is measured at the same points as leaf litter is measured to quantify quality of available herbaceous ground cover. Only desirable vegetation is thus measured and can be related directly to the established reference standards.



## LITERATURE

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