Integrated Vegetation Management
IVM Partners
Managing Ecosystems Together!

IVM and Ecosystem Management

Utility-Agency Partnership

A Memorandum of Understanding (MOU) was signed in Washington, DC in May 2006, between the federal land management agencies and the Edison Electric Institute (representing investor owned electric utilities), stating that all parties would endorse the use of integrated vegetation management (IVM) on electric utility rights-of-way. IVM is a system in which undesirable vegetation is identified, action thresholds are considered, and all possible control options evaluated and selected control(s) implemented. Control options, which include biological, chemical, cultural, manual, and mechanical methods, are used to prevent or remedy unacceptable, unreliable, or unsafe conditions. Choice of control option(s) is based on effectiveness, environmental impact, site characteristics, worker/public health and safety, security, and economics. The goal of an IVM system is to manage vegetation to balance benefits of control, costs, public health, environmental quality, and regulatory compliance.

IVM Standard

The American National Standard Institute ANSI A300 (Part7) - 2006 outlines IVM practices for electric rights-of-way (ROW) as follows:

1. Define the objectives
2. Define action thresholds
3. Inspect the site to determine if thresholds are met and what control is necessary
4. Pre-control evaluation should include ROW use, type of electric line, general conditions, ownership, intended uses, adjacent uses, existing vegetation, topography, soils, fire risk, sensitive or protected areas or species, water resources and regulations.
5. Proactively communicate
6. Choose and implement appropriate control methods
7. Post control evaluation, quality assurance and documentation

Consensus Building

IVM Partners conducted integrated vegetation management workshops for Washington, DC-based federal land management agency personnel for three consecutive years (October 2005-07) at Chesapeake Farms, a wildlife research center located near Rock Hall, MD along a tributary of the Chesapeake Bay. Federal agency attendees, representing the United States Forest Service, Fish & Wildlife Service, National Park Service, Bureau of Land Management, Department of Defense, and Environmental

Protection Agency, were impressed with the timely application of IVM techniques demonstrated by industry partners and the resulting ecosystem restoration. IVM Partners President Rick Johnstone reviewed the vegetation management plans used for habitat restoration and provided a before and after pictorial summary of each technique. Michael Haggie, a botanist from the conservation group Chesapeake Wildlife Heritage, reviewed documentation of plant specie changes as herbicides controlled undesirable and non-native invasive plants, and released desirable plants native to each ecosystem.

Regional Workshop Need

The federal agency personnel unanimously agreed that these IVM Workshops were highly valuable in helping them understand the impact of various vegetation management techniques and the need for an integrated approach. They emphasized that most vegetation management decisions were not made by the Washington offices, but instead were made by regional office personnel whom were more educated on local issues and problems. They expressed a need for Regional IVM Workshops that could offer demonstrations and best practices to both the federal and state regulatory personnel as well as the requesting industry personnel. This would insure that each party would have a clear understanding of what constituted the best IVM practices for their region, with consideration given for unique geographic and ecosystem concerns.

Objectives

The primary objective of a high voltage electric ROW is safe and reliable transmission of power and ready access for emergency or maintenance workers. Similarly, natural gas and oil ROW need ready access for inspection, testing and maintenance of pipelines, while roadside ROW require safety and sight distance.

ROW can have secondary objectives desired by land management agencies that can best be summarized as Ecosystem Management. Ecosystem Management objectives protect native rare specie populations affected by ROW establishment, construction, or maintenance; restore or protect threatened and endangered specie habitat; manage ROW areas to enhance wildlife habitat; and reduce the introduction and control the spread of non-native invasive species or noxious weeds in the ROW and adjacent lands.

IVM Partnerships

IVM Partners has been established as a liaison between utility and federal or state agencies because it recognizes each party’s primary and secondary objectives and works to develop mutually beneficial vegetation management plans. To document ecosystem reclamation, plant community changes are monitored by a professional botanist to measure the success of the management plan in meeting both primary and secondary objectives.

Documentation

Documentation of IVM benefits in meeting primary objectives of electric ROW and secondary benefits to ecosystem concerns have been performed sparingly. Drs Bramble and Byrnes in the highlands of Pennsylvania started the most widely referenced studies in 1953, and they continue to this day. Their studies document the benefits of IVM in providing safe, reliable and accessible electric ROW while also enhancing habitat for a wide range of wildlife, from whitetail deer to salamanders and butterfly. But if a Vegetation Manager is operating in an entirely different type of ecosystem in another geographic area of the country, there is scant research to predict the primary and secondary benefits of an IVM approach. Without any credible documentation of IVM benefits or the best practices within a particular area, many federal and state land managers have been wary of allowing utility Vegetation Managers the option to use all possible controls, especially the use of herbicides.

Cooperative Management

Effective Ecosystem Management may require additional knowledge of the historical habitat types of the target management area, and the species that are extirpated or threatened due to the loss of that important habitat. Ecosystem Management also requires acknowledgment by all parties that ROW corridors can act as positive links between important isolated habitats. A Vegetation Manager may adjust IVM techniques to:

- Allow shrubs to grow across a ROW due to their importance in providing shaded habitat crucial to the survival of certain threatened or endangered species.
- Choose herbicides and apply in a fashion that duplicates the effects of fire, where plant species are dependent on a fire regime.
- Manage for low growing, cool burning plants to allow the ROW to act as a firebreak, where wildfire is a concern.
- Target additional species that may not necessarily threaten the primary management objectives due to the negative effects of non-native invasive plants to important habitat.
- Link habitats to allow the ROW to act as a greenway for range expansion of threatened species and intermingling of their genes.

Standardized Methodology

IVM Partners has embarked on a program to document plant community changes derived from various IVM techniques throughout various geographic regions of the country. The following format shall be used:

1. Choose management areas that impact federal or state agency lands, industry land holdings or utility or highway rights-of-way.
2. Interview land stakeholder(s) to determine their vegetation management needs or objectives; safe access and reliability, sight distance, wildlife habitat, endangered specie habitat, pollinators, invasive weed control, etc.
3. Develop a synergistic vegetation management plan specific to the land and the primary and secondary objective(s) of the stakeholders.
4. Develop a GIS map of the management area, noting any environmental or archeological sensitive sites.
5. Perform a botanical and photo documentation of the plant community present on the management site prior to any interventions.
6. Implement the most appropriate integrated vegetation management technique(s).
7. Document cost data of the vegetation management techniques used, including the type and rate of herbicides.
8. Perform a botanical and photo documentation of the plant community changes

before and after each technique

General Vegetation Survey Methodology
A standardized template of using transects to sample plant communities prior to vegetation clearing for a new ROW, or prior to adoption of a new vegetation management regime, is developed. This baseline plant specie data is then compared against subsequent plant community changes after each growing season resulting from the implementation of various IVM techniques.

A minimum two growing season sampling is recommended following a change in IVM techniques to provide statistically valid data. Additional years may be sampled to monitor plant community stability or specie succession from herbaceous to shrub/scrub plant communities.

A linear transects survey method, suitable for following long-term vegetation succession, is used (from R.L. Smith, 1966, with modifications by D. Whigham). On utility ROW, a 20m-wide by 100m-long centrally located section of ROW, excluding any 10m-wide central access route, is typically selected as representative of the ROW vegetation to be surveyed. On highway ROW, a similar sized area is selected outside of the road surface and adjacent to regularly mowed area. A similar untreated (UT) area may be selected and surveyed as a control. IVM treatment history is collected and summarized (see Table 1).

Baseline data of tree, shrub and herbaceous species is taken prior to new ROW construction or the introduction of herbicide treatments following a history of hand or mechanical cutting. A short-term study would be two years of data after each growing season following the new management regime intervention, while a long-term study would be a minimum of five years. Tree and shrub data are collected after each growing season in the fall of each year. Herbaceous data is collected in the spring if flowering herbaceous plants are a priority. A four letter code is assigned to each plant identified using the first two letters of the genus and species of the Latin name; e.g. *Dichantelium clandestinum* (L) Gould = DICL, or, if genus is only possible, DISP (*Dichantelium species)*.

TREE/SHRUB PLOTS: Typically three 2m x 100m shrub plots, 10m apart, are established lengthwise (see Figure 4a) to the ROW or ten 2x10m plots crosswise (see Figure 4b). Surveying 15-20% of the area is considered statistically optimum. Orientation will depend on the site and management goals in the central part of the sample ROW. Wetland ecosystems lend themselves to easier access and less vegetation disruption if the shrub plots are oriented across the ROW. Shrub survey lines are commenced 5-10m from either end of each survey perimeter in order to reduce edge effect.

HERBACEOUS PLOTS: Herbaceous plots 1m square are laid out along the mid-line of each 2m x 100m lengthwise or 2x10m crosswise shrub plot at 0 m, 5 m and 10 m. Their central points are marked with wire flags. The beginning and end point of transects are marked with more permanent fiberglass or metal (re-bar) stakes. Surveying 10-15% of the area is considered a good rule of thumb. To one side of the transect a 5-10 m buffer is left to reduce the edge effect of shading from the adjacent woodland, if present, and the travel effect of the maintenance corridor at the other. Herbaceous vegetation is stem counted and percent cover is estimated following identification by species.

All specimens are identified to genus and where practical to species. A prefabricated meter square made from 12.5 mm PVC schedule-40 plastic water pipe is used along the survey line, within which data are gathered. These are either 1m x1m or 0.5x2m. Smaller squares (0.75m or 0.5m) may be used, depending on time availability, budget and diversity of vegetation. A simple graph, plotting the number of species to the number of plots within which a species is found, can be used to determine the number of plots needing surveyed for statistical purposes.

In addition to simple data analysis (number species, percent cover, stem count, etc.), a modified relative importance value (RIV), developed by J.T. Curtis (1959) in Mueller-Dombois (1974), has been developed (Whigham, 2003) as follows:

FOR HERBS: **RIV = (relative frequency + relative % cover)/2**; where relative frequency = f of a species/sum f of all species x 100; f = # plots in which a species is found/total # plots in the survey. Relative cover = (% cover of a species/% cover of all species) x 100.
FOR SHRUBS: **RIV = (relative frequency + relative density)/2**; where relative frequency = as above for herbs; and relative density = (# individuals of a species/total # individuals of all species) x 100.

The RIV values for each species can be combined to provide totals for desirable (D), undesirable (U) vegetation and woody vine species groups for each season and year. A high RIV indicates that a particular species or species group was found to occur at a higher density relative to a species or species group having a lower RIV value.

Once the RIV analysis has been performed, the data can be analyzed to identify plant community population trends as follows:

1. Annual specie comparison (numerical, percent cover, presence/absence, desirable/undesirable)
2. List of species present (herb, shrub, tree, wetland or upland ecosystems)
3. Ecosystem comparison (grass, forbs, or shrub communities)
4. Beneficial plant communities for various types of wildlife, birds, pollinators, etc.

Nomenclature used for herbaceous and woody species is taken from Brown and Brown (1972 and 1984), Gleason and Cronquist (1991) and for bryophytes, Shuttleworth and Zim (1967)

Multiple data sets can be established to monitor plant community changes, e.g. on electric ROW in the “wire zone” (area under conductors plus ten feet outside conductors) or the “border zone” (area from “wire zone” to ROW edge). Various sets of statistical methods can be applied to the data and the resulting research findings written as a peer-reviewed paper.

Continuing Education

A review of the regional best practices vegetation plan and results shall be shared with the Utility Arborist Association, Edison Electric Institute, National Roadside Vegetation Management Association and other interested industry and agency parties, and the general public as follows:

1. An educational workshop shall be conducted for the stakeholders and others in each region with similar management concerns, including land grant universities. The workshop shall include classroom discussion and a slide presentation review of the management steps, a field tour of the management area and field demonstrations of the integrated vegetation management techniques used.
2. Advertise the workshop date in industry and agency publications, websites and email notices, with appropriate media and congressional invitations.
3. Conduct the workshop during an appropriate season to highlight the beneficial plant community changes.
4. Provide handouts and other information to the attendees for use in disseminating the information to other interested parties.
5. Encourage continued study and sharing of the results with the university system.
6. Adjust secondary objectives or introduce new techniques as warranted.
7. Post the slide presentation and other pertinent information on the Internet for continued public education and discussion (www.ivmpartners.org).
8. Publish results in industry journals of the collaborators.
9. Act as a liaison and information source for the stakeholders to adopt the best management practices across the region.
10. Act as a liaison and information source for other industries and agencies that share the vegetation issues of rights-of-way corridor management.

Performance Outcome

The following beneficial outcomes are expected in each region:

1. An increased adoption of IVM practices by industry and public agencies.
2. Increased use of best practices, such as ultra-low volume applications, to lower the level of risk to humans and the environment.
3. Business case studies that support the use of IVM best practices conformed to regional geographic differences.
4. Increased partnerships between utilities and public agencies.
5. Overall public awareness of the benefits of an integrated approach
6. Improved safety, habitat, watershed protection, invasive weed control and restoration of ecosystems serving a wide variety of wildlife, pollinators, and threatened or endangered species.

Year/Season	Treatment	Effected Quads	Notes
1992 Fall	Clear-cut (CC) Select-cut (SC)	NW, SE NE, SW	CC = tree stumps & shrubs mown to ground level SC = undesirable trees and shrubs removed
1993 Fall	Initial Herbicide Select-Spray (SS)	NE, SE	Code 031, foliage/hydraulic broadcast. NW, SW untreated (UT)
1994 Summer	Follow-up Herbicide Select-Spray (SS)	NE, SE	Same as 1993.
1995	None	All	
1996	None	All	
1997 Summer	Follow-up Herbicide Select-Spray	All	Code 031G, foliage/hydraulic broadcast Code XG670

Table 1: Indian Mission CDP ROW treatment history, Sussex Co. Delaware, USA.

UPLAND HERBICIDE CODES, MIXTURES and RATES

Code 031 1993 = 4.73L (1.25 US gal.) Accord* + 1.18dl (4 oz.) Arsenal + 1.89L (0.50 US gal.) Cleancut +
0.95L (0.25 US gal.) Weedar 64 + 1.18dl (4 oz.) 38F drift control
in 378.5L (100 US gal.) water.
Code XG670 1997 = 4.73L (1.25 US gal.) Accord* + 4.14dl (14 oz.) Garlon 3A + 1.18dl (4 oz.) Arsenal +
56.78L (15 US gal.) Thinvert (total volume = 62.07L (16.4 US gal.))
in 378.5L (100 US gal.) water. Used in upland.
Code 031G 1997 = 4.73L (1.25 US gal). Accord* + 0.95L (0.25 US gal.) Garlon 3A + 1.18dl (4 oz.)
Arsenal + 1.89L (0.50 US gal.) Cleancut + 1.18dl (4 oz.) 38F drift control
in 378.5L (100 US gal.) water.
*Glyphosate applied at a rate of 10.44 L/ha (4 qts/ac), 53.8% active ingredient (a.i.)

TRADE NAMES OF HERBICIDES USED

Accord (common name: glyphosate isopropylamine), composition = 53% concentration of isopropylamine salt of N - [phosphono-methyl] glycine.
Arsenal, (family name: imidazolinone), composition = isopropylamine salt of imazapur (2- [4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridine carboxylic acid).
Garlon 3A, (common name: Triclopyr), composition = 3,5,6-trichloro-2-pyridinyloxyacetic acid.
Weedar (common name: 2,4-D), composition = dodecylamine + tetradecylamine salts of 2,4-D.
(Ref: Meister and Sine, 1996).
Surfactants used were Cleancut, Thinvert and 38F used for drift control.

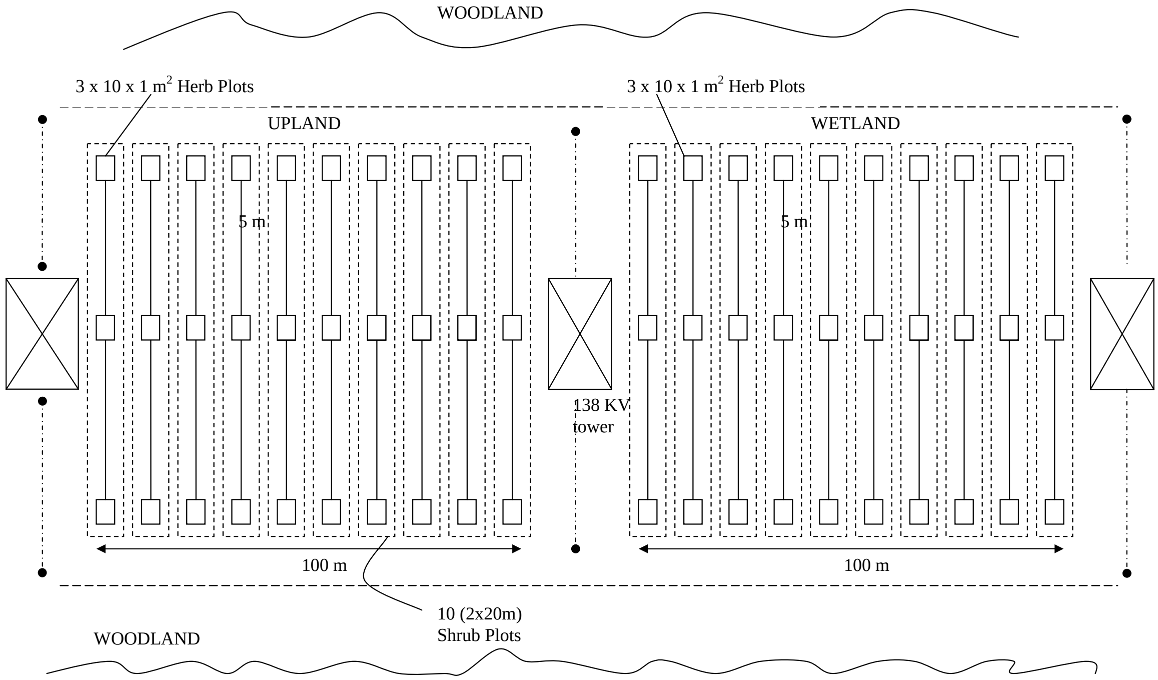

Fig. 4 a: General 138 KV Transmission Line Research Survey Layout for ROW Centerline.

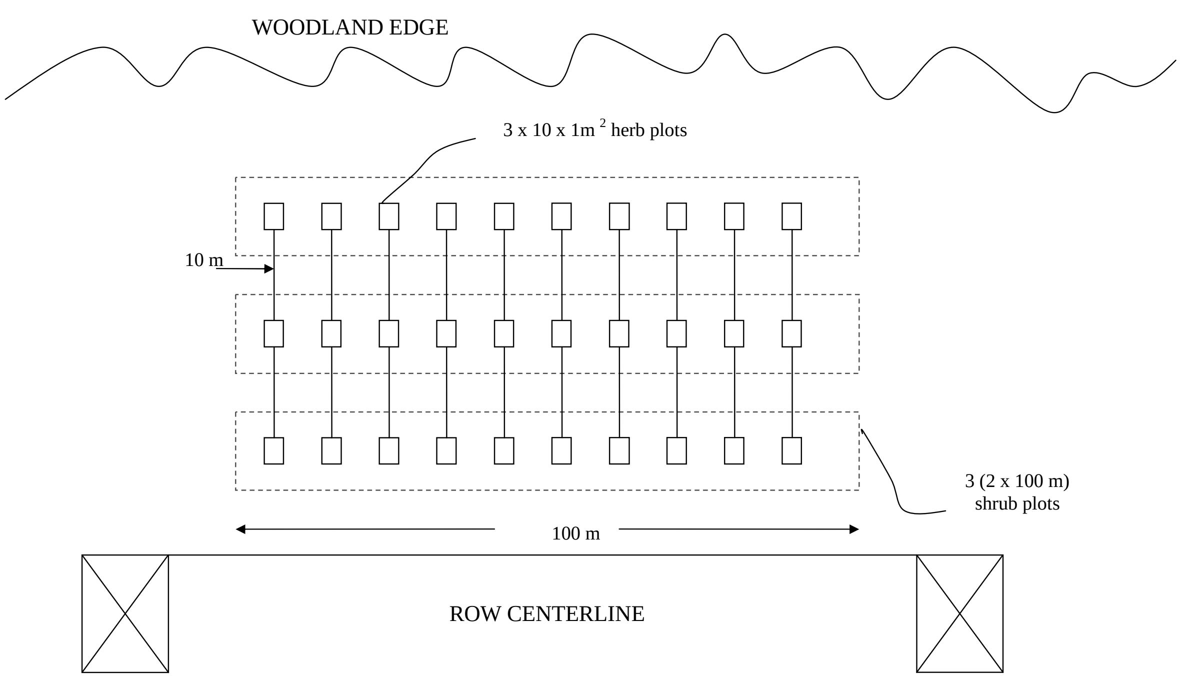

Fig. 4 b. General 138KV Transmission Line Research Survey Layout for ROW Border Zone.