Willowy Monardella Monitoring Survey 2005

Marine Corps Air Station Miramar
San Diego, California

Final Report
December 2005

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1.0 Executive Summary

This report details the 2005 monitoring survey for the endangered willowy monardella *(Monardella linoides* spp. *viminea, now Monardella viminea*) on the eastern portion of Marine Corps Air Station (MCAS) Miramar. The purpose of the survey was to provide essential information for the continuing management of this federally endangered species, and to support MCAS Miramar's stewardship commitments regarding population census, health, and management decisions.

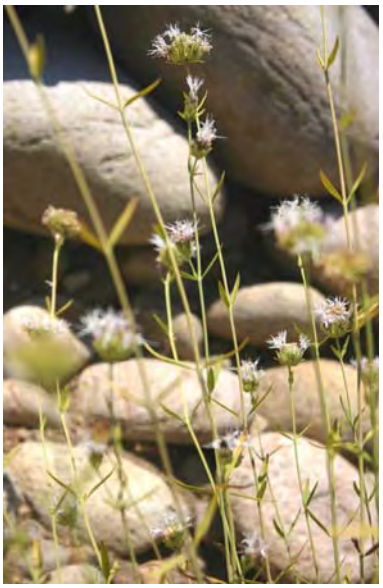
This survey assessed the willowy monardella population using an established monitoring protocol provided by the Environmental Management Department at MCAS Miramar. This protocol had been developed and employed during 2003 and 2004, thus making comparisons over time possible. Averaging over all 15 survey plots, there has been a 75% decline in the numbers of willowy monardella individuals from 2003 to 2005. This decline in numbers continues the losses already evident in 2004 when sampling took place after the Cedar Fire. The Cedar Fire had affected all willowy monardella plots in the project footprint. Documentation of the reduced numbers is presented. Some hypotheses are presented to explain the loss, include the negative, combined impacts of drought, fire, and severe flooding, all exacerbated by competition from invasive annual grasses and herbs.

2.0 Introduction

The purpose of this project was to conduct monitoring surveys of willowy monardella *(Monardella viminea*, formerly *Monardella linoides* ssp. *viminea)* populations using an established monitoring protocol provided by Marine Corps Air Station (MCAS) Miramar (Dossey and Rebman 2005). The data collected during the surveys were analyzed and compared with data collected from prior years with the goal of identifying population trends and reporting on the status of the monitored population at MCAS Miramar. The purpose of the surveys was to support stewardship regarding population census, health, and management decisions. This work may also support current U.S. Fish and Wildlife Service (USFWS) evaluations.

3.0 Background

On October 13, 1998 willowy monardella (Photo 1) was listed by the USFWS as endangered (USFWS 1998, Federal registration number 63:5937) throughout its historic range in southwestern California and northwestern Baja California, Mexico. This species occurs in and along ephemeral drainages in coastal sage scrub, chaparral, and grassland habitats and is threatened by a variety of factors including urban and agricultural development, competition from nonnative plant species, off-road vehicle use, mining, grazing, and trampling by hikers and horseback riders.

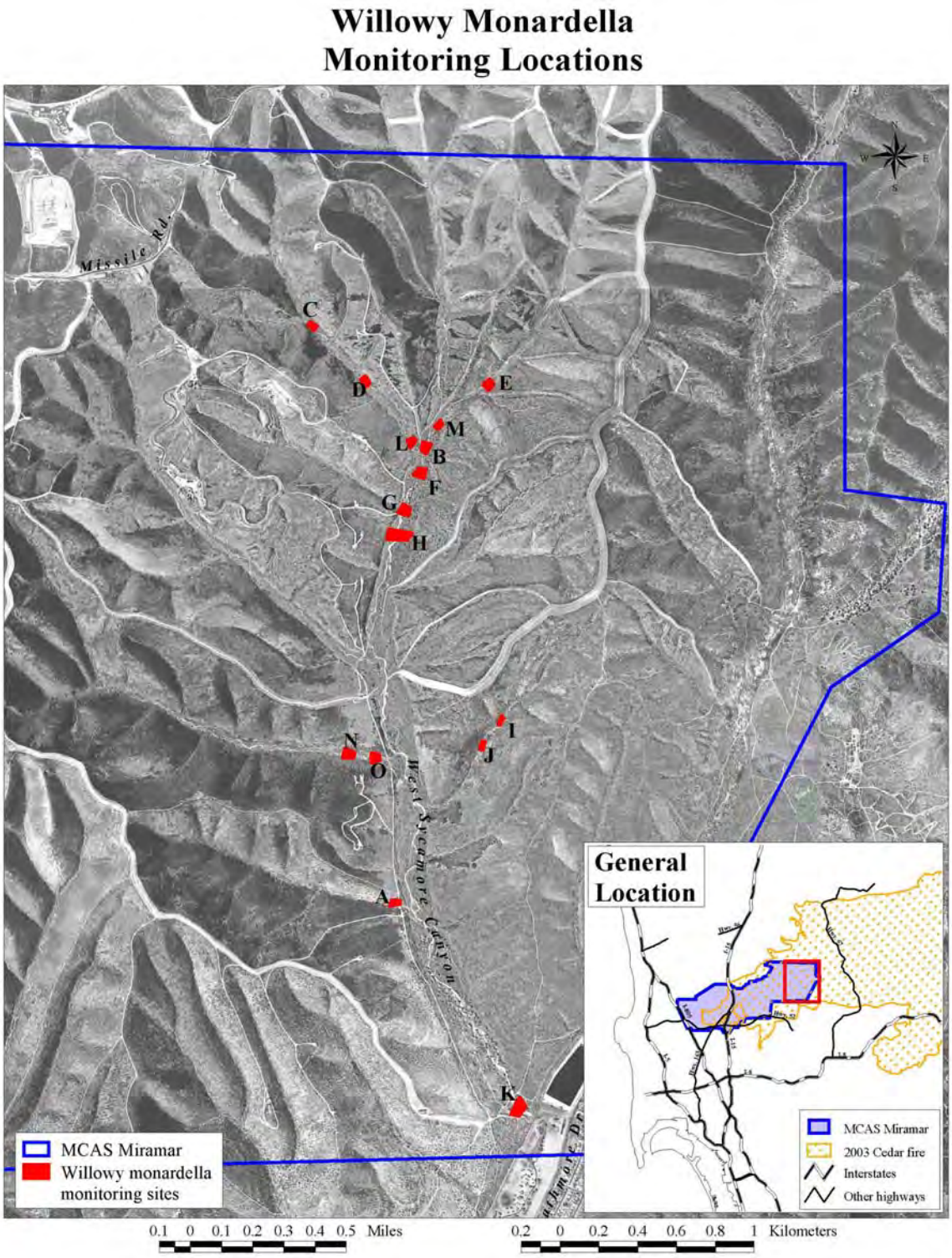


The northern population, which includes Miramar, was recently separated from a population in the Otay Mesa area and has been elevated to the species status of *Monardella viminea* (Elvin 2003).

MCAS Miramar began conducting status surveys of willowy monardella in 2003-2004. This is the third consecutive year of sampling surveys to identify population trends for management recommendations. In addition to the population status, observations regarding willowy monardella population ecology are also important, such as possible pollinators, the impact of the 2005 El Niño rains on reproduction, and potential population loss from the 2003 Cedar Fire.

4.0 Project Location

The monitoring survey area is situated along West Sycamore Canyon within the eastern portion of MCAS Miramar. This area is located north of State Route 52, west of Highway 67, south of Beeler Canyon, and east of Interstate 15 (see Map 1).



Map 1. Location of willowy monardella monitoring sites at Marine Corps Air Station Miramar. Note the entire area depicted above was part of the 2003 Cedar fire (see inset map).

5.0 Site Description

There are fifteen (15) monitoring sites (Map 1) previously established by the San Diego Natural History Museum that are located within West Sycamore Canyon and a portion of Sycamore Canyon. Most of the sites are located near fire roads, which provide access to these undeveloped areas. The 15 monitoring sites encompass approximately seven acres of undeveloped land. The sites are delineated by permanent metal stakes, painted blue. Currently, the vegetation at the sites is primarily non-native grasses and herbs with sparse to dense coastal sage scrub on the stream benches. Most of the stream beds themselves are comprised of barren cobbles and sand (Photo 2). Prior to the 2003 Cedar Fire, there was more forb and small shrub cover at the monitoring sites as opposed to non-native grasses.

Photo 2. Rocky streambed with willowy monardella (foreground and center of photo).

6.0 Methods

A. Ecological Evaluation Protocols/Decisions

Tierra Data, Inc. (TDI) conducted field surveys on four dates (7/28/05, 7/29/05, 8/1/05, 8/3/05). At each monitoring site, TDI collected population data and other information per Station monitoring protocols (Dossey and Rebman 2005) using the Station's data collection form (Appendix A). Previously mapped monardella locations were revisited by using existing Global Positioning System (GPS) locations, and all existing live and dead monardella plants within each monitoring plot were re-mapped using a Trimble Pro-XR GPS unit to sub-meter accuracy. The GPS data was converted to Environmental Systems Research Institute (ESRI) ArcView shape files to facilitate production of maps illustrating the locations of willowy monardella at each monitoring site.

The data collected included the number of willowy monardella plants at each monitoring site (including both live and dead plants), the number of plants within four (4) age/size classes (Table 1), and phenology of the plants (Table 2). (Definitions of the terms used and how they were

applied to the observed plants are given in Appendix B). Also recorded was information on associated plant species, including a complete plant species list and the percent cover of any species of 5% total cover or more; description of the stream channel, including substrate (rocky or sandy), width, and depth; and miscellaneous natural history observations, including insect visitations (as possible pollinator species), herbivory, and any other observations regarding the condition of the site.

Table 1.

Age Class Categories
seedling
juvenile
mature
adult

Table 2.

Phenology Categories
vegetative
budding
flowering
between flowering & fruiting
seeding
dormant/dead

B. Statistical Analysis Protocols/Decisions

The population data collected was entered into an MS Excel spreadsheet for comparison to previous data from 2003 and 2004. The three datasets were used to assess population trends at each of the three monitoring sites, including overall population sizes and age class distributions.

C. GPS/GIS Protocols

All GPS/GIS data were collected according to Station protocols to sub-meter accuracy using the California State Plane NAD83 Zone 6 U.S. Survey Feet map projection. Plant locations within the 2005 monitoring plots were mapped, as were the drainage outline and the corner stakes for each monitoring site. The raw GPS data was converted to Environmental Systems Research Institute (ESRI) ArcView shape files to facilitate the production of maps illustrating the locations of monardella at each monitoring site.

D. Site Revisits to Document by Individual Plant Changes in the 2005 Census Compared to 2003

Four sites were revisited on December 14, 2005 to verify the census by examining each plant location from two years, 2003 and August 2005. The four revisited sites were A, J, N and O. Two GPS units were taken to the revisited plots; one was loaded with 2003 data points, the other with 2005 data points. On these plots, a plant-for-plant comparison was made of the 2003 and 2005 data, including absent plants. That is, if a plant previously reported in 2003 was not located during the August 2005 surveys, a photograph was taken of its previous location and a subjective assessment was made of the probable cause of its loss. If the previous location was covered in dense grasses, the vegetation was pulled to try and locate the submerged plant. During this process, also documented were which of the 2005 plant records are considered new locations, not previously recorded in 2003 or 2004.

7.0 Results

A. Plant Location Maps

A total of 202 plants were located this year (Figure 1, Map 2). The numbers of plants located on the 15 monitoring sites in 2005 varied widely, from a low of a single individual (Sites D and M), up to a high of 60 (Site I). See Appendix C for detailed maps of all monitoring sites.
The 202 individuals documented this year are far fewer than 50% of those 2004, when 526 plants were found on the monitoring sites (Figure 1), and only 25% of what was seen in 2003 prior to the Cedar Fire (802 plants).

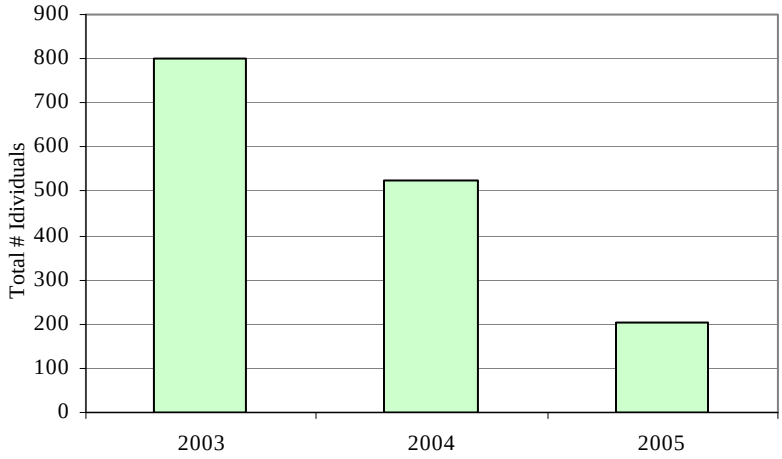


Figure 1. Total number of willowy monardella individuals located on monitoring sites from 2003 through 2005.

B. Analysis

When compared to monitoring data from previous years, there has been an overall decrease in willowy monardella numbers in most of the monitoring sites (Table 3, Figures 2 and 3). Across all plots there has been an overall 75% decrease in willowy monardella numbers from 2003 to 2005, and 62% from 2004 to 2005. At three sites, there was an increase in monardella numbers between 2003 and 2004 (Sites G, J, and N), only to see the 2005 numbers drop back below 2003 levels (Table 3). Two sites (Sites A and E) did show a moderate increase in willowy monardella from 2004 to 2005, while all but one of the other plots showed some reduction in willowy monardella numbers (Site L remained at 7 plants, as documented in 2004).

Table 3. Numbers of willowy monardella individuals at 15 monitoring sites from 2003-2005.

Monitoring Year	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Total
2003	31	21	19	4	22	122	25	64	367	54	5	6	5	31	26	802
2004	13	11	19	2	5	40	28	53	193	73	4	7	4	65	9	526
2005	16	4	4	1	9	24	14	24	60	19	3	7	1	16	4	202

Willowy Monardella Locations Mapped at 15 Monitoring Sites in 2005

Monitoring sites

• Willowy monardella locations*

**See Appendix C for detailed maps of each monitoring site.*

Note that except for a few locations (e.g. south of Site J and between Sites N & O) the locations shown here do not represent a complete census of all Monardella locations in the area.

Map 2. Locations of willowy monardella at 15 monitoring sites in 2005. See Appendix C for close-up detailed maps of each site.

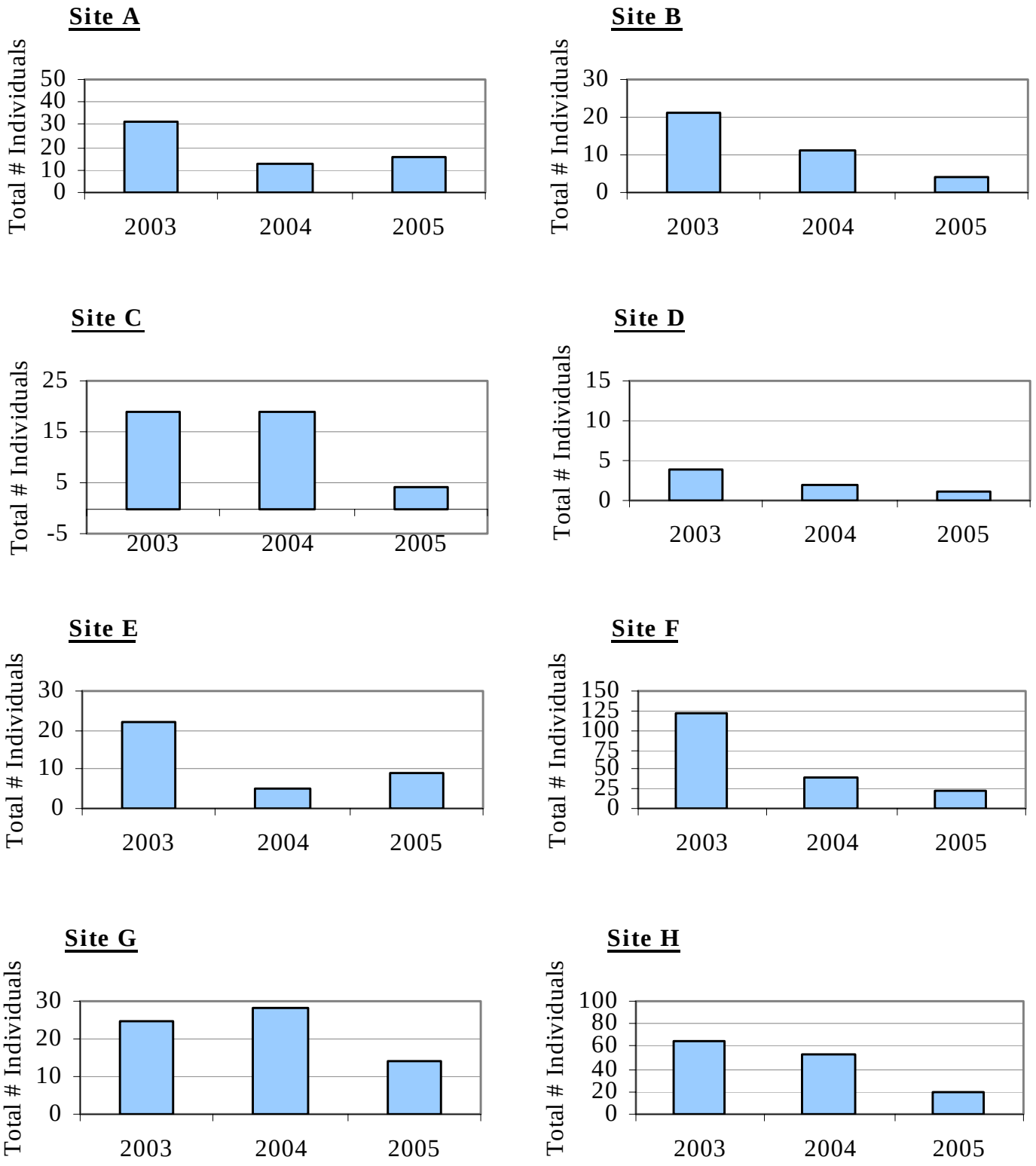


Figure 2. Willowy monardella monitoring data 2003-2005: total number of individuals, Sites A through H. Note that, due to the wide range of values across all of the monitoring sites, the individual graphs are shown at different scales to better illustrate the changes in numbers from year-to-year.

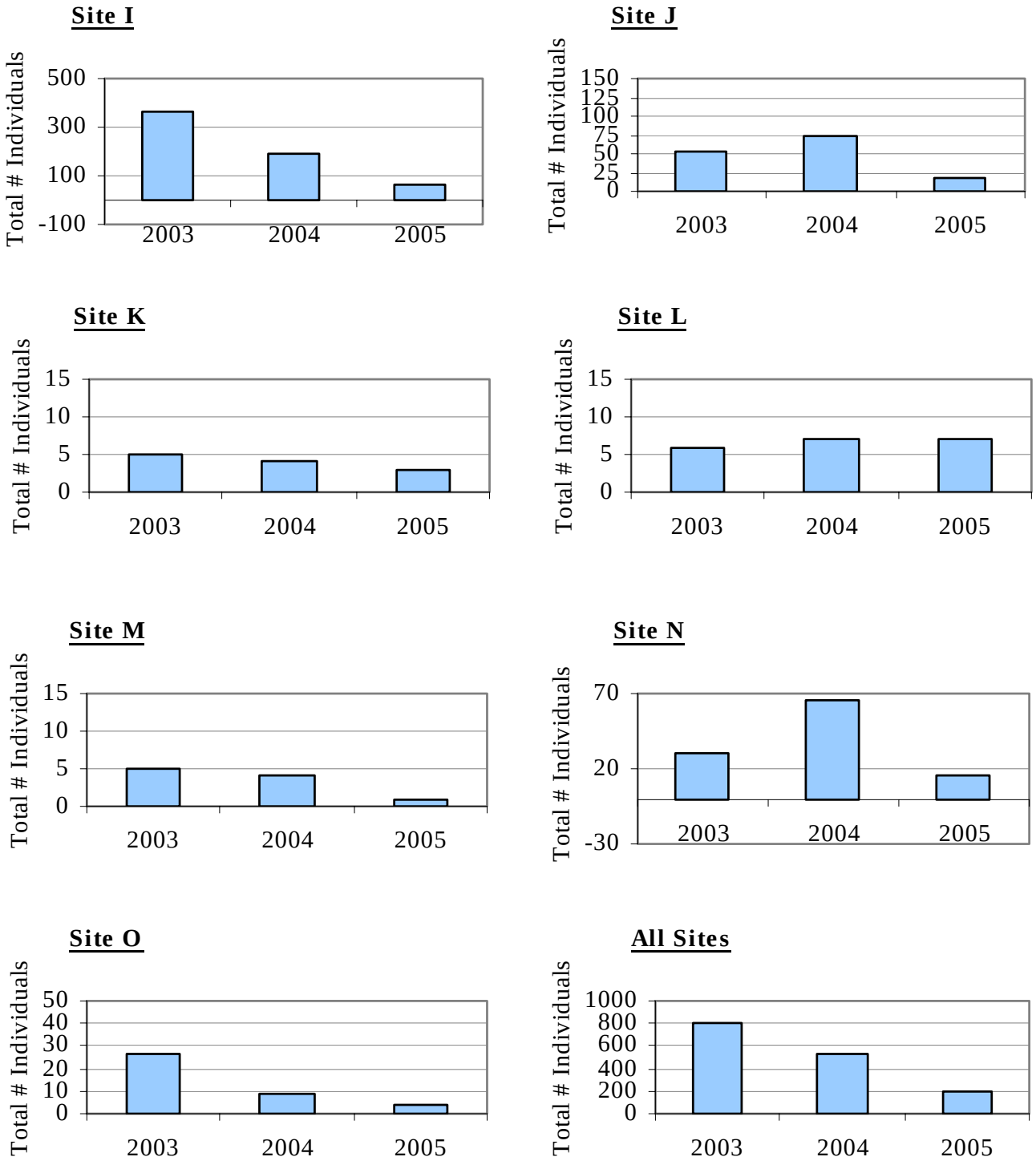


Figure 3. Willowy monardella monitoring data 2003-2005: total number of individuals, Sites I through O, plus total number across all sites. Note that, due to the wide range of values across all of the monitoring sites, the individual graphs are shown at different scales to better illustrate the changes in numbers from year-to-year.

As in previous years, the majority of the plants located in 2005 were classified as Adults (67.8%), with 26.7% classified as Mature, and only one plant classified as a Juvenile (Figure 4 and Figure 5). Although a few seedlings were seen on the sites in 2003 and 2004, no seedlings were observed on any of the sites this year. Eight plants (or about 5% of the total) were either dead or dormant. Nearly all of the plants seen (96%) were in reproductive status (either flowering, fruiting, or in seed), with slightly less than half of the live plants in seed (48.5%). The remaining reproductive plants were nearly evenly split between flowering (23.2%) and flowering/fruiting (24.7%).

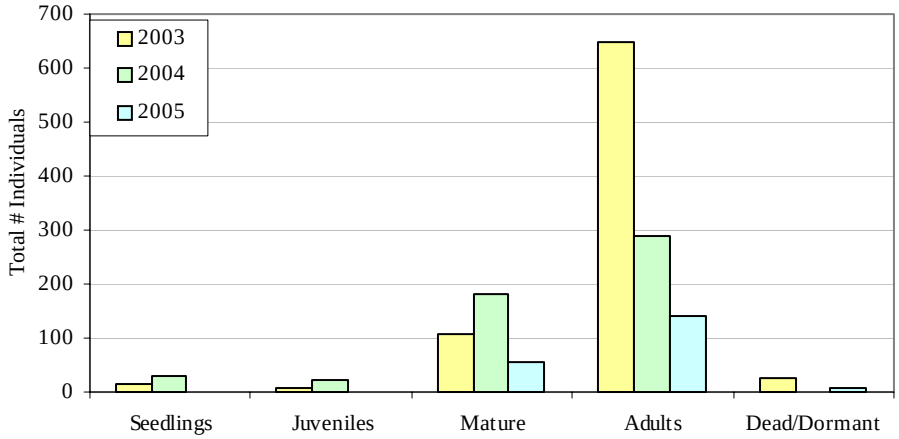


Figure 4. Distribution of life stages of willowy monardella located in 2003, 2004 and 2005 at MCAS Miramar (see Appendix B for definition of each life stage).

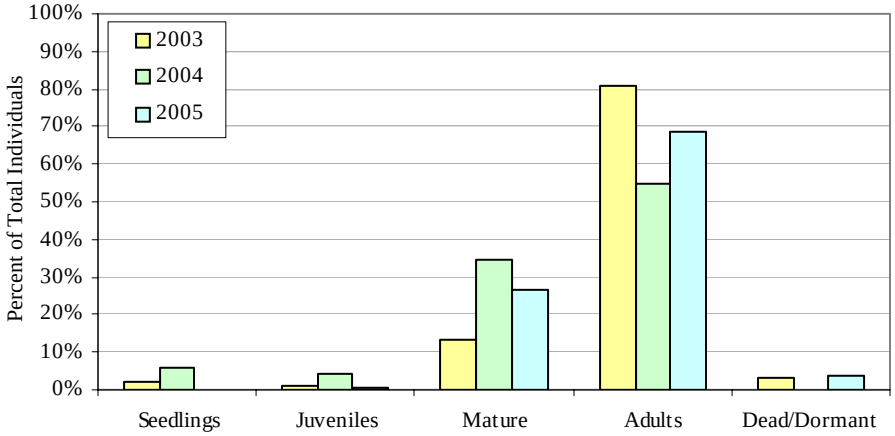


Figure 5. Relative contribution of five life stage categories of willowy monardella located in 2003, 2004 and 2005 at MCAS Miramar (see Appendix B for definition of life stages).

C. Habitat Evaluation

Six of the 15 monitoring sites had between 70% and 90% cover of non-native grasses (five plots with wild oats [*Avena* spp.], the sixth with Italian ryegrass [*Lolium multiflorum*]). Seven other plots had between 24% and 50% cover of non-native grasses (wild oats or brome [*Bromus* sp]). Plot K was the only plot where non-native grasses were not dominant. On that plot, the highest percent cover recorded was 10% for both buckwheat (*Eriogonum fasciculatum*) and California

sagebrush (*Artemisia californica*). Table 4 presents the percent cover estimates for dominant plant from 2003 through 2005.

Table 4. Average percent cover values for dominant plant species willowy monardella monitoring sites in 2003- 2005.

Species name	2003	*Standard error*	2004	*Standard error*	2005	*Standard error*
Exotic grasses	**40**	***11***	**49**	***8.4***	**59**	***7.6***
Avena sp.	21	*8.4*	33	*5.2*	51	*7.5*
Bromus sp.	-	-	31	*5.5*	24	*5.3*
Bromus hordeaceus	19	*7.6*	5.0	*0.0*	-	-
Lolium multiflorum	-	-	-	-	18	*7.1*
Vulpia myuros	-	-	-	-	5.0	-
Forbs	**20**	***3.5***	**28**	***6.9***	**2.3**	***1.5***
Brassica nigra	3.0	*1.4*	6.8	*0.57*	-	-
Centaurea melitensis	4.7	*1.8*	8.8	*1.7*	-	-
Erodium sp.	5.3	*2.3*	21	*6.5*	20	-
Hirschfeldia Incana	-	-	-	-	7.5	*0.9*
Hypochaeris glabra	-	-	5.0	-	-	-
Rumex crispus	-	-	5.0	*0.0*	-	-
Phacelia sp.	-	-	5.8	*0.5*	-	-
Silene gallica	6.7	*3.8*	10	*3.2*	-	-
Shrubs	**29**	***7.2***	**8.6**	***2.5***	**2.7**	***1.7***
Artemisia californica	-	-	-	-	10	-
Baccharis sarathroides	0.3	*0.33*	7.0	*0.7*	5.0	-
Brickellia californica	0.3	*0.33*	-	-	-	-
Ceanothus tomentella	6.0	*3.3*	-	-	-	-
Cercocarpus betuloides	3.3	*1.4*	8.0	*0.7*	5.0	-
Cuscuta sp.	1.3	*1.3*	-	-	-	-
Eriodictyon crassifolium	0.7	*0.45*	-	-	5.0	-
Eriogonum fasciculatum	12	*4.1*	5.0	*0.0*	10	-
Monardella viminea	0.7	*0.7*	-	-	-	-
Quercus berberidifolia	0.3	*0.3*	-	-	-	-
Rhamnus crocea	0.3	*0.3*	5.0	-	5.0	-
Salvia sp.	2.0	*1.4*	-	-	-	-
Toxicodendron diversifolia	1.7	*1.2*	5.0	*0.0*	5.0	-

Comparing the 2005 cover data over time data indicates that annual grass cover is increasing on the sites, on average (Figure 6), while forb cover has dropped off dramatically (from nearly 30% average in 2004 to less than 5% in 2005. Average shrub cover is also much lower, dropping from 9% in 2004 to under 3% in 2005.

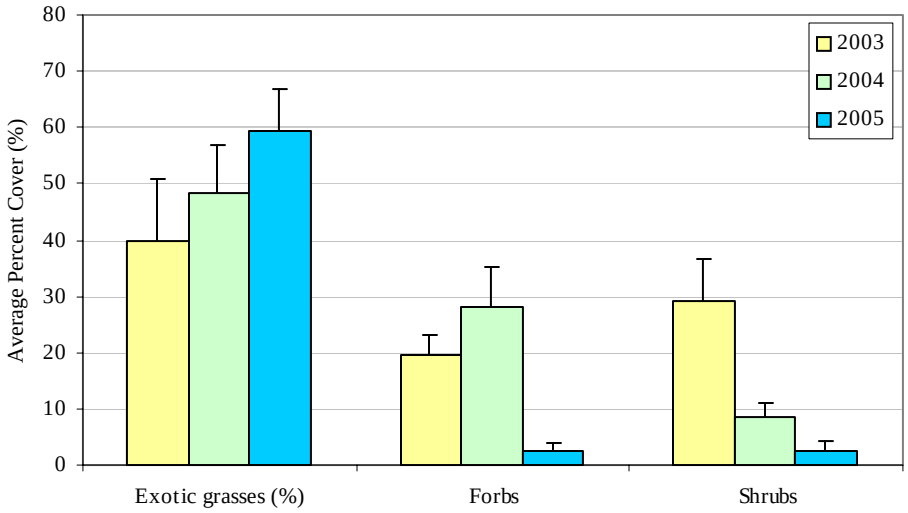


Figure 6. Comparison of average percent cover (± standard error) of plant growth form types on the monardella monitoring sites from 2003-2005.

Insect/Pollinator Observations

Bees and flies were the most commonly observed insects in 2005, including honeybees, bumble bees, solitary bees, Vespid wasps, hover flies, and bee flies. Northern white skippers were seen at three plots, including observations on willowy monardella plants, and grasshoppers were observed at Plot J. An Acmon blue butterfly was observed at Plot I. See Photo 3.

Northern white skipper

Acmon blue butterfly

Vespid wasp

Photo 3. Examples of invertebrates observed at MCAS Miramar willowy monardella monitoring plots.

D. Results of December 2005 Site Revisits

Complete results of the December 2005 revisits of four plots are presented in Appendix D. One live plant was observed that had been missed in 2005, and additional dead plants were documented; however, others were simply missing (Photo 4). The missed live plant and the dead ones were usually buried with no visible seed heads or stems in dense annual grasses, which had to be cleared to locate the dead individual willowy monardella plant. Many other plants are missing (as documented in the photos), apparently due to scouring and deposition caused by flooding the previous season. A few plants located in 2005 were not documented in 2003. A single live individual, located with a GPS unit in August, was newly missing by the December revisit. It had been growing near a road culvert. Table 5 shows results of the revisits to four plots.

Photo 4. Plant #8 is missing, replaced with Avena fatua.

Table 5. Results of revisiting four plots (A, J, O, and N) on December 14, 2005 to document plant-for-plant the status of observed and missing individual willowy monardella plants.

Individual Plant Status in Four Plots Revisited in December 2005	**Plot A**	**Plot J**	**Plot N**	**Plot O**	**Total**
Number of individuals missing in 2005, documented in 2003	5	25	24	2	56
Probable cause of individual loss, stream scour or bank erosion	*3*	*14*	*2*	*8*	*27*
Probable cause of individual loss, sediment deposition	*2*	*11*	*0*	*2*	*15*
*Probable cause of individual loss, annual grass invasion**	*0*	*0*	*0*	*14*	*14*
Number of live plants newly documented in 2005	0	1	0	0	1
Number of live plants relocated in 2005, also recorded in 2003	4	15	7	2	28
Number of dead plants documented by site revisit in December, not observed in August 2005 (usually due to burial by sediment or mulch)	2	0	2	1	5
Number of live plants observed in December but not August, 2005	0	1	0	1**	2
Number of plants observed in August 2005, missing in December 2005	1	0	0	0	1
Number of Live Individuals Recorded in 2003	**31**	**54**	**31**	**26**	**142**
Number of Live Individuals Recorded in 2004	**13**	**73**	**65**	**9**	**160**
Number of Live Individuals Recorded in 2005	**16**	**19**	**16**	**4**	**55**

** Annual grass invasion was partly a result of new sediment deposited in the channel, abundant rainfall, and possibly a fertilizing effect of the 2003 Cedar Fire.*
*** Individual was on plot boundary and was considered outside the plot during the August 2005 survey.*

8.0 Discussion

There are several events that contributed significantly, in part or in combination, to the dramatic decline in willowy monardella individuals at the monitoring sites in 2005 compared to previous years. The Cedar Fire in October of 2003 occurred during a record-breaking drought. Seed production was probably hampered during this period, so plants were unable to respond when the drought broke starting in the fall of 2004. Most plots were already suffering losses in 2004, as shown in the tables already presented. The 2003 monitoring data were collected prior to the fire, so the sharp decrease in numbers at most sites in 2004 is almost certainly a result of the fire, or the fire in combination with drought. However, the decline continued after the 2004 surveys.

Floods resulting from the exceptionally heavy rains in 2004-2005 and post-fire upslope conditions of reduced soil cover clearly contributed significantly to the willowy monardella losses. The 2004-2005 rain year was one of the wettest on record for the San Diego region. National Weather Service records at Lindbergh Field show, for the first time since records (beginning in 1850) were kept, that 4.00 inches or more of rain fell in four separate months in a single season. The total rainfall for the 2004-2005 rain year was 22.5 inches compared to a long-term average annual of about 10 inches, very similar to MCAS Miramar rainfall. The maximum annual record at Lindbergh field is 24.93 inches.

Whole stream beds were realigned in about half the plots (see for example, A, B, D, F, G, I, N, and O maps in Appendix C). Other losses were through direct mortality by scour or sedimentation, or through washing away of reproductive material. As a result of the December revisit of four plots, it is estimated that more than two-thirds of the losses observable in 2005 are believed to be due directly or indirectly to flood scour and sedimentation.

The GPS plot locations between 2003 and 2005 were close enough in accuracy (within 50 cm in general) to preclude this as a significant problem in censusing plants from year to year. A small number of the observation discrepancies among years of individual plants and of cover conditions may be due to the fact that different field crews conducted the assessment each year. Observer error is most possible when locating dead individuals that are buried in grass mulch or deposited sediment. It is not always possible to distinguish between browned willowy monardella stems and other browned grass or forb plants. There are certainly other dead plants buried in the non-native annual mulch layer left behind from this past year of exceptional growth that were not documented as dead during the August surveys because it was not possible to distinguish them from other dead vegetation. Alternatively, it is possible they were washed away before the grasses overcame the site. As a result, these individuals are simply missing from the census. Observer error is also likely for the visual estimates of percent cover, which are somewhat subjective especially at lower cover values, despite the visual aids provided. One crew might estimate a certain species to be present at 5% cover, another might see it as below 5% and therefore would not report a percent cover for that species. However, in the larger picture of plant loss, these errors are relatively minor.

Despite their infrequency, post-fire flood dangers and the fire-flood cycle are well-documented in southern California and, considering willowy monardella's predisposition for streamside locations, one would expect the species would have adapted to this phenomenon. Perhaps the longer-term story may be found downstream in depositional areas where reproductive material may have accumulated, or still remains to be seen within the plots as time passes.

The MCAS Miramar populations are not the only monardellas in the county experiencing stress. It has been noted in Lopez Canyon (near Rancho Peñasquitos) that monardella does not compete well with other plants and can be choked out by weeds which invade the streamside terraces (Greer and Cheong 2005). A close relative of willowy monardella, *Monardella stoneana*

(Jennifer's monardella), which occurs in Marron Valley near the Mexican border in San Diego County, occurs in a drainage much steeper than those visited in West Sycamore Canyon, apparently thriving in a higher-frequency fire regime than occurs on MCAS Miramar (E. Kellogg, pers. obs.). That population is not as prone to flood because it is high up in a drainage.

In light of the recent varied and dramatic stresses in its environment, no one management intervention is left as an obvious choice for assisting the maintenance and expansion of this species on MCAS Miramar. In addition, far-reaching prescriptions may be in error given the limited understanding of this plant's population ecology and reproductive requirements, and the short time since the flooding. To what extent the recent stressors are the final story is speculative.

Management efforts elsewhere by the Friends of the Peñasquitos Canyon Preserve, have sought to limit channel scouring in urban-interface environments by slowing the rate of flow through the use of A-Jacks (Keith and Cheong 2005). A-Jacks are 80 lb concrete units that interlock to form a permeable chain that slows water movement. Additional research would be required to provide guidance for intervention alternatives. Occurrences of the plant may have experienced location shifts within West Sycamore Canyon, due to the higher stream flows in 2005. Thus managers may benefit from a limited survey downstream of the 15 plots. In addition, coordination and informational exchange with the Friends of Los Peñasquitos Canyon Preserve, especially in regard to horticulture, may help with management decisions.

Fire planning for willowy monardella may need to take into account the distribution of the plants in order to protect the genetic range of the plant on MCAS Miramar. The natural resilience of the willowy monardella plant to fire, a result of its growth habitat and its position in mostly barren stream beds or terraces, is tested when the invasion of annual grasses results in extreme fuel conditions and fire hazard for which the species has not adapted. Modern-day, large fires such as the Cedar Fire can burn entire drainages rather than landscape patches, placing at risk what genetic diversity may be sheltered in individual drainages. In slow-moving fires where human life is not at risk, there sometimes is time for a resource advisor to provide guidance to firefighters that could protect a species from whole-scale losses from single fires, and subsequent floods. Other fire suppression or pre-suppression measures could also be considered.

In future years, it would benefit the analysis to conduct a plant-for-plant search on at least a subset of the plots, with full documentation of the locations where plants were previously documented and are now missing.

A final recommendation is that missing corner posts should be replaced to support the data collection in future years.

9.0 References

Dossey, Rod and Jon Rebman. 2005. DRAFT Monitoring Protocol for Willowy Monardella, MCAS Miramar. San Diego Natural History Museum, courtesy Environmental Management Department, MCAS Miramar.

Elvin, Mark. 2003. Novon 13(4):426.

Greer, Keith and Holly Cheong. 2005. Saving a rare plant in an urban environment. Fremontia 33(1)18-22.

U.S. Fish and Wildlife Service (USFWS). 1998. Federal Register 63:5937.

Appendix A. Dates in the field, personnel working on the project and data collection sheets

Dates in the Field

Field surveys for the willowy monardella were conducted on:

July 29, 2005
July 30, 2005
August 1, 2005
August 3, 2005.
December 14, 2005

*Names of Persons Working on the Project**

Elizabeth Kellogg (LK, L), Project Lead Biologist
Harry Smead (HS, H), Rob Wolf (RW, R), Scott Snover (SS, S), Biologists
Dana Tully (DT, D), Natural Resources Technician
James Kellogg, Brian Munson, GIS Specialists

**(Surveyor initials used on datasheets are shown in parentheses).*

Data Collection Sheets

Attached

Willowy Monardella Data Collection Sheet

Date 7/29/05 Start Time 1:40 End Time 3:25

Study Site Label WSYS12005A Detailed or Normal Survey Effort Detailed

Surveyors HS, LK

Demographic Data (entire monitoring site, use tic marks):

Life Stage		Phenology	
Number of Seedlings	0	Number Vegetative	0
Number of Juveniles	0	Number Budding	0
Number of Mature	6	Number Flowering	9
Number of Adults	4	Number between Flower and Fruit	0
Number of Dead/Dormant	1	Number in Seed	1
Total Number of Individuals	11	Number Dormant/Dead	1

Habitat Data:

Surrounding Species Observed (Use the plant list sheet with codes. Add percent cover next to species names.)

List any new species below using the botanical name and the estimated percent cover next to the species name.

25% Avena fatua

5% Rhamnus crocea

5% Vulpia 5% Hirschfeldia incana

Describe the Channel (width, depth, rockiness etc.)

cobbly/stream moved since last recording

2 plants were on stream bank rather than in cobbles

Natural History Observations (pollinators, herbivory, other noticeable features)

white Skipper

Sulfury bees

white skipper on the monardella w/dark shading on wing tips

need 4" + meterstick

Add Clump size dimensions or other notes on back of this survey sheet.
Remember to use the 6" rule where applicable.

vehicle tracks across stream

downstream group smothered in Avena

Willowy Monardella Data Collection Sheet

Date 8/1/05 Start Time 12:45 End Time 1:00

Study Site Label WSYS1245B Detailed or Normal Survey Effort Detailed

Surveyors H, L, R, D

Demographic Data (entire monitoring site, use tic marks):

Life Stage		Phenology	
Number of Seedlings	0	Number Vegetative	0
Number of Juveniles	0	Number Budding	0
Number of Mature	1	Number Flowering	1
Number of Adults	3	Number between Flower and Fruit	2
Number of Dead/Dormant	0	Number in Seed	1
Total Number of Individuals	4	Number Dormant/Dead	0

Habitat Data:

Surrounding Species Observed (Use the plant list sheet with codes. Add percent cover next to species names.)

List any new species below using the botanical name and the estimated percent cover next to the species name.

80% Avena
5% Cercorpus
5% Lolium

Describe the Channel (width, depth, rockiness etc.)

up to 3' deep; cobbly/sandy

Natural History Observations (pollinators, herbivory, other noticeable features)

Add Clump size dimensions or other notes on back of this survey sheet.
Remember to use the 6" rule where applicable.

Willowy Monardella Data Collection Sheet

Date 8/1/05 Start Time 2:15 End Time 2:30

Study Site Label WSYS12WSC Detailed or Normal Survey Effort Detailed

Surveyors H, R, D

Demographic Data (entire monitoring site, use tic marks):

Life Stage		Phenology	
Number of Seedlings	0	Number Vegetative	0
Number of Juveniles	0	Number Budding	0
Number of Mature	0	Number Flowering	0
Number of Adults	4	Number between Flower and Fruit	2
Number of Dead/Dormant	0	Number in Seed	2
Total Number of Individuals	4	Number Dormant/Dead	0

Habitat Data:

Surrounding Species Observed (Use the plant list sheet with codes. Add percent cover next to species names.)

List any new species below using the botanical name and the estimated percent cover next to the species name. 30% Avena

30% Bromus Hor

5% Poison ivy 5% yerba santa

Describe the Channel (width, depth, rockiness etc.)

cobbly 18"-5'

Natural History Observations (pollinators, herbivory, other noticeable features)

Add Clump size dimensions or other notes on back of this survey sheet.
Remember to use the 6" rule where applicable.

Willowy Monardella Data Collection Sheet

Date 8/1/05 Start Time 1:50 End Time 2:10

Study Site Label WSYS12005D Detailed or Normal Survey Effort Detailed

Surveyors H, L, R, D

Demographic Data (entire monitoring site, use tic marks):

Life Stage		Phenology	
Number of Seedlings	0	Number Vegetative	0
Number of Juveniles	0	Number Budding	0
Number of Mature	0	Number Flowering	1
Number of Adults	1	Number between Flower and Fruit	0
Number of Dead/Dormant	0	Number in Seed	0
Total Number of Individuals	1	Number Dormant/Dead	0

Habitat Data:

Surrounding Species Observed (Use the plant list sheet with codes. Add percent cover next to species names.)

List any new species below using the botanical name and the estimated percent cover next to the species name.

90% Avena barbata
10% Lolium

Describe the Channel (width, depth, rockiness etc.)

Channel < 1"/2" cobbly
dominated by Lolium

Natural History Observations (pollinators, herbivory, other noticeable features)

Add Clump size dimensions or other notes on back of this survey sheet.
Remember to use the 6" rule where applicable.

Willowy Monardella Data Collection Sheet

Date 7/28/05 Start Time 11:00 End Time 11:55

Study Site Label WSYS12005E Detailed or Normal Survey Effort Detailed

Surveyors L, H

Demographic Data (entire monitoring site, use tic marks):

Life Stage		Phenology	
Number of Seedlings	0	Number Vegetative	1
Number of Juveniles	0	Number Budding	0
Number of Mature	6	Number Flowering	7
Number of Adults	3 (1 on line plot)	Number between Flower and Fruit	1
Number of Dead/Dormant	0	Number in Seed	0
Total Number of Individuals	9 ~~8~~ 8	Number Dormant/Dead	0

Habitat Data:

Surrounding Species Observed (Use the plant list sheet with codes. Add percent cover next to species names.)

List any new species below using the botanical name and the estimated percent cover next to the species name.

80% Lolium multiflorum
10% Avena Fatua

Describe the Channel (width, depth, rockiness etc.)

cobbles
most on 1° channel margin w/in 2ft of channel
2 on 1st terrace above cobbly channel

Natural History Observations (pollinators, herbivory, other noticeable features)

Plot burned
Dominated by Lolium
Possibly can't find some because buried by annual grasses

GPS (previous) show plots upslope

Add Clump size dimensions or other notes on back of this survey sheet.
Remember to use the 6" rule where applicable.

If the plants weren't blooming, we probably couldn't see

Willowy Monardella Data Collection Sheet

Date 8/1/05 Start Time 11:45 End Time 12:30

Study Site Label WSYS12005F Detailed or Normal Survey Effort Detailed

Surveyors H, L, R, D

Demographic Data (entire monitoring site, use tic marks):

Life Stage		Phenology	
Number of Seedlings	0	Number Vegetative	1
Number of Juveniles	1	Number Budding	0
Number of Mature	3	Number Flowering	17
Number of Adults	20	Number between Flower and Fruit	1
Number of Dead/Dormant	0	Number in Seed	4
Total Number of Individuals	23	Number Dormant/Dead	0

Habitat Data:

Surrounding Species Observed (Use the plant list sheet with codes. Add percent cover next to species names.)

List any new species below using the botanical name and the estimated percent cover next to the species name.

90% Avena
5% Lolium
20% Erodium

Describe the Channel (width, depth, rockiness etc.)

cobbly channel; up to 5' deep

Natural History Observations (pollinators, herbivory, other noticeable features)

white skipper, bee
bee-like fly

1 photo of shredded cutting

Add Clump size dimensions or other notes on back of this survey sheet.
Remember to use the 6" rule where applicable.

Willowy Monardella Data Collection Sheet

Date 8/1/05 Start Time 11:15 End Time 11:45

Study Site Label WSYS12005G Detailed or Normal Survey Effort Detailed

Surveyors L, H, D, R

Demographic Data (entire monitoring site, use tic marks):

Life Stage		Phenology	
Number of Seedlings	0	Number Vegetative	0
Number of Juveniles	0	Number Budding	0
Number of Mature	2	Number Flowering	0
Number of Adults	10	Number between Flower and Fruit	3
Number of Dead/Dormant	2	Number in Seed	9
Total Number of Individuals	14	Number Dormant/Dead	2

Habitat Data:

Surrounding Species Observed (Use the plant list sheet with codes. Add percent cover next to species names.)

List any new species below using the botanical name and the estimated percent cover next to the species name.

50% Avena barbata

5-10% Lolium

Describe the Channel (width, depth, rockiness etc.)

old stream terrace, < 2' ≦ 0-3'

Natural History Observations (pollinators, herbivory, other noticeable features)

Add Clump size dimensions or other notes on back of this survey sheet.
Remember to use the 6" rule where applicable.

Willowy Monardella Data Collection Sheet

Date 8/1/05 Start Time 10:00 End Time 11:00

Study Site Label WSYS12005H Detailed or Normal Survey Effort Detailed

Surveyors L, H, D, R

Demographic Data (entire monitoring site, use tic marks):

Life Stage		Phenology	
Number of Seedlings	0	Number Vegetative	2
Number of Juveniles	0	Number Budding	0
Number of Mature	6	Number Flowering	1
Number of Adults	14	Number between Flower and Fruit	1
Number of Dead/Dormant	0	Number in Seed	16
Total Number of Individuals	20	Number Dormant/Dead	0

Habitat Data:

Surrounding Species Observed (Use the plant list sheet with codes. Add percent cover next to species names.)

List any new species below using the botanical name and the estimated percent cover next to the species name. 35% Avena barbata
10% Lolium

Describe the Channel (width, depth, rockiness etc.)

cobbly stream terrace (old channel)

Natural History Observations (pollinators, herbivory, other noticeable features)

hover flies on monardella

Add Clump size dimensions or other notes on back of this survey sheet.
Remember to use the 6" rule where applicable.

1- 1m x 0.7m clump

Willowy Monardella Data Collection Sheet

Date 8/3/05 Start Time 10:15 End Time 10:55

Study Site Label WSYS12005I Detailed or Normal Survey Effort Detailed

Surveyors H, R

Demographic Data (entire monitoring site, use tic marks):

Life Stage		Phenology	
Number of Seedlings	0	Number Vegetative	0
Number of Juveniles	0	Number Budding	0
Number of Mature	9	Number Flowering	3
Number of Adults	51	Number between Flower and Fruit	20
Number of Dead/Dormant	0	Number in Seed	37
Total Number of Individuals	60	Number Dormant/Dead	0

Habitat Data:

Surrounding Species Observed (Use the plant list sheet with codes. Add percent cover next to species names.)

List any new species below using the botanical name and the estimated percent cover next to the species name.

50% Bromus

Describe the Channel (width, depth, rockiness etc.)

very cobbly 0< 2ft

Natural History Observations (pollinators, herbivory, other noticeable features)

Butterfly, Bumble bee, brown skipper

Add Clump size dimensions or other notes on back of this survey sheet.
Remember to use the 6" rule where applicable.

1 x .5 meters 1 x .4
1 x .4 1.3 x .5 1.6 x 5
1 x .75 1 x .5 1.5 x 1

Willowy Monardella Data Collection Sheet

Date 8/3/05 Start Time 9:45 End Time 10:10

Study Site Label WSYS12005J Detailed or Normal Survey Effort Detailed

Surveyors H, R

Demographic Data (entire monitoring site, use tic marks):

Life Stage		Phenology	
Number of Seedlings	0	Number Vegetative	0
Number of Juveniles	0	Number Budding	0
Number of Mature	6	Number Flowering	1
Number of Adults	13	Number between Flower and Fruit	5
Number of Dead/Dormant	0	Number in Seed	13
Total Number of Individuals	19	Number Dormant/Dead	0

Habitat Data:

Surrounding Species Observed (Use the plant list sheet with codes. Add percent cover next to species names.)

List any new species below using the botanical name and the estimated percent cover next to the species name.

40% Avena

10% Bromus Hor

Describe the Channel (width, depth, rockiness etc.)

0-1ft Large cobbles/w island

Natural History Observations (pollinators, herbivory, other noticeable features)

bee

grasshopper

Add Clump size dimensions or other notes on back of this survey sheet.
Remember to use the 6" rule where applicable.

Willowy Monardella Data Collection Sheet

Date 7/28/05 Start Time 8:30 End Time 9:45

Study Site Label WSYS12005K Detailed or Normal Survey Effort Detailed

Surveyors L, H

Demographic Data (entire monitoring site, use tic marks):

Life Stage		Phenology	
Number of Seedlings	0	Number Vegetative	0
Number of Juveniles	0	Number Budding	1
Number of Mature	3	Number Flowering	2
Number of Adults	0	Number between Flower and Fruit	0
Number of Dead/Dormant	0	Number in Seed	0
Total Number of Individuals	3	Number Dormant/Dead	0

Habitat Data:

Surrounding Species Observed (Use the plant list sheet with codes. Add percent cover next to species names.)

List any new species below using the botanical name and the estimated percent cover next to the species name.

5-10% Eriog. fasc.
5-10% Ar Cal
5% B. Sarothiorde

2 clumps of Fen cactus in plot

Describe the Channel (width, depth, rockiness etc.)

old stream terrace Between 2 utility towers, w/in 3 ft of road in channel itself, severe bank undercutting (~~not~~ roots exposed on one)

Natural History Observations (pollinators, herbivory, other noticeable features)

big competition problem w/ Avena fatua + Vulpia myuros

3/5 stakes missing

Add Clump size dimensions or other notes on back of this survey sheet.
Remember to use the 6" rule where applicable. - Suggestion: say whether is by base or by canopy

SW corner stake missing - tracked vehicle tracks

8 mtn bikers

Willowy Monardella Data Collection Sheet

Date 8/1/05 Start Time 1:25 End Time 1:45

Study Site Label WSYS12005L Detailed or Normal Survey Effort Detailed

Surveyors H, L, D, R

Demographic Data (entire monitoring site, use tic marks):

Life Stage		Phenology	
Number of Seedlings	0	Number Vegetative	0
Number of Juveniles	0	Number Budding	0
Number of Mature	1	Number Flowering	0
Number of Adults	6	Number between Flower and Fruit	7
Number of Dead/Dormant	0	Number in Seed	0
Total Number of Individuals	7	Number Dormant/Dead	0

Habitat Data:

Surrounding Species Observed (Use the plant list sheet with codes. Add percent cover next to species names.)

List any new species below using the botanical name and the estimated percent cover next to the species name. 90% Arena

Describe the Channel (width, depth, rockiness etc.)

up to 2' ; cobbly + sand, invaded by Arena

Natural History Observations (pollinators, herbivory, other noticeable features)

2 solitary bees
2 white skippers
honeybee / or bromor

Add Clump size dimensions or other notes on back of this survey sheet.
Remember to use the 6" rule where applicable.

Willowy Monardella Data Collection Sheet

Date 8/1/05 Start Time 1:00 End Time 1:20

Study Site Label WSYS12005M Detailed or Normal Survey Effort Detailed

Surveyors Harry S, Rob W, Liz K, Dana T

Demographic Data (entire monitoring site, use tic marks):

Life Stage		Phenology	
Number of Seedlings	0	Number Vegetative	0
Number of Juveniles	0	Number Budding	0
Number of Mature	0	Number Flowering	1
Number of Adults	1	Number between Flower and Fruit	0
Number of Dead/Dormant	0	Number in Seed	0
Total Number of Individuals	1	Number Dormant/Dead	0

Habitat Data:

Surrounding Species Observed (Use the plant list sheet with codes. Add percent cover next to species names.)

List any new species below using the botanical name and the estimated percent cover next to the species name.

90% Avena fatua
5% Lolium

Describe the Channel (width, depth, rockiness etc.)

cobbly / invaded by Lolium

Natural History Observations (pollinators, herbivory, other noticeable features)

1st photo - dead broken Tryn + oak

Add Clump size dimensions or other notes on back of this survey sheet.
Remember to use the 6" rule where applicable.

Willowy Monardella Data Collection Sheet

Date 8/3/05 Start Time 8:40 End Time 9:05

Study Site Label WSYS12005N Detailed or Normal Survey Effort Detailed

Surveyors H, R

Demographic Data (entire monitoring site, use tic marks):

Life Stage		Phenology	
Number of Seedlings	0	Number Vegetative	0
Number of Juveniles	0	Number Budding	0
Number of Mature	9	Number Flowering	2
Number of Adults	7	Number between Flower and Fruit	5
Number of Dead/Dormant	0	Number in Seed	9
Total Number of Individuals	16	Number Dormant/Dead	0

Habitat Data:

Surrounding Species Observed (Use the plant list sheet with codes. Add percent cover next to species names.)

List any new species below using the botanical name and the estimated percent cover next to the species name.

25% Avena

5% Bromus diandrus

Describe the Channel (width, depth, rockiness etc.)

0-1 ft

Natural History Observations (pollinators, herbivory, other noticeable features)

Add Clump size dimensions or other notes on back of this survey sheet.
Remember to use the 6" rule where applicable.

Willowy Monardella Data Collection Sheet

Date 8/3/05 Start Time 8:15 End Time 8:35

Study Site Label WS5S2W50 Detailed or Normal Survey Effort Detailed

Surveyors H, R

Demographic Data (entire monitoring site, use tic marks):

Life Stage		Phenology	
Number of Seedlings	0	Number Vegetative	0
Number of Juveniles	0	Number Budding	0
Number of Mature	2	Number Flowering	1
Number of Adults	2	Number between Flower and Fruit	1
Number of Dead/Dormant	0	Number in Seed	2
Total Number of Individuals	4	Number Dormant/Dead	0

Habitat Data:

Surrounding Species Observed (Use the plant list sheet with codes. Add percent cover next to species names.)

List any new species below using the botanical name and the estimated percent cover next to the species name.

30% Avena barbata

10% HIR Inc

Describe the Channel (width, depth, rockiness etc.)

Depth 18" 12ft to 3+6 ft Rocks (split)

Natural History Observations (pollinators, herbivory, other noticeable features)

Add Clump size dimensions or other notes on back of this survey sheet.
Remember to use the 6" rule where applicable.

NE stake gone

Appendix B. Definitions of Age and Phenology Classes

Definitions For Willowy Monardella Monitoring Surveys

Seedling: A life stage assessment for any willowy monardella clump observed lacking multiple stems and less than four inches tall. Phenology: The annual life cycle stage of each plant at the time of survey, e.g., vegetative, flowering seeding etc.

Vegetative: A phenological assessment that the plant lacks any reproductive parts but isn't dried out/dormant.

Mature: A life stage assessment for any willowy monardella clump observed more than four inches tall and having less than 20 stems.

Adult: A life stage assessment for any willowy monardella clump having more than 20 stems and more than four inches tall.

Juvenile: Any monardella plant observed that is lacking multiple stems and more than four inches tall.

Flowering: A phenological assessment that the monardella has one or more flowers.

Dead/Dormant: A phenological and life stage assessment for individuals that are dried out and lack any obvious living tissue.

N: A scientific short hand for the number of individuals.

Seeding: A phenological assessment that a plant has finished flowering but still producing seeds.

Budding: A phenological assessment that plants have flower buds, but the flowers have not expanded to open yet.

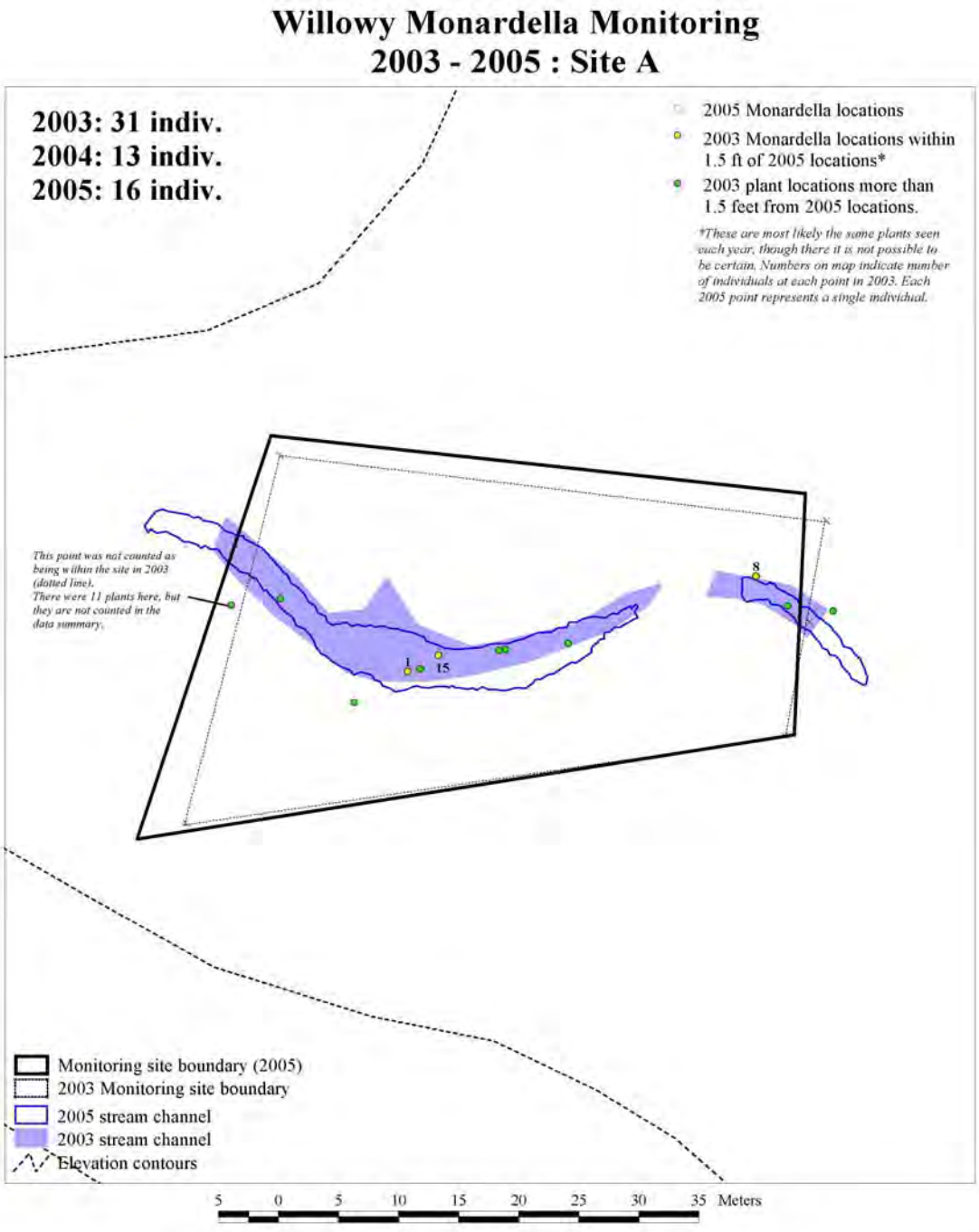
Between Flowering and Seeding: A phenological assessment that there is no evidence of flowering or seeding, but all parts of the clump are clearly between those two stages.

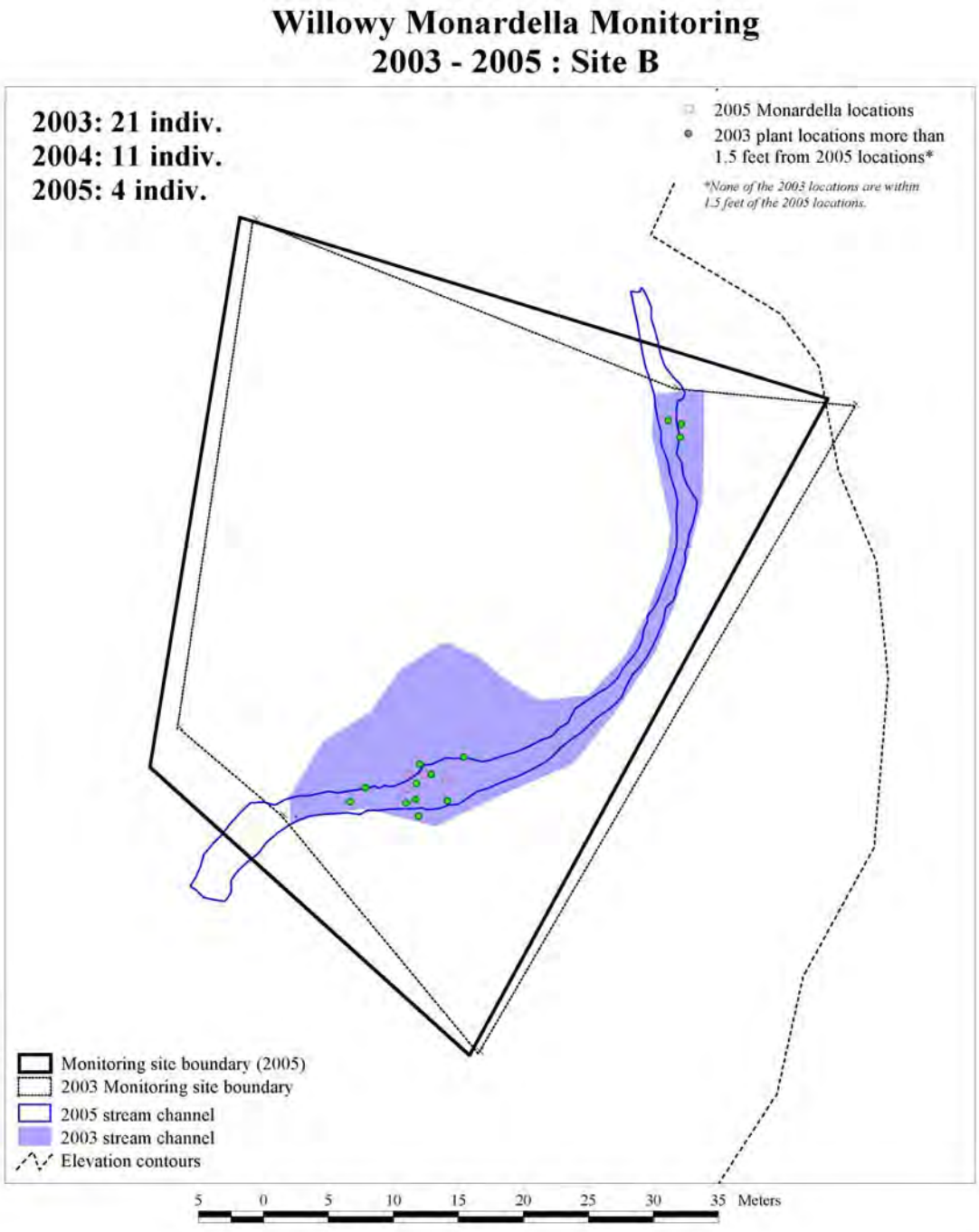
Clump: A group of one or more willowy monardella plants growing sufficiently intertwined that distinguishing individuals is difficult or impossible.

Channel: The low point in the flood plain where water obviously flows as indicated by scour marks in the vicinity.

*** 6" Rule:** For purposes of this survey any individuals that are separated by less than 6" are counted as the same individual clump.

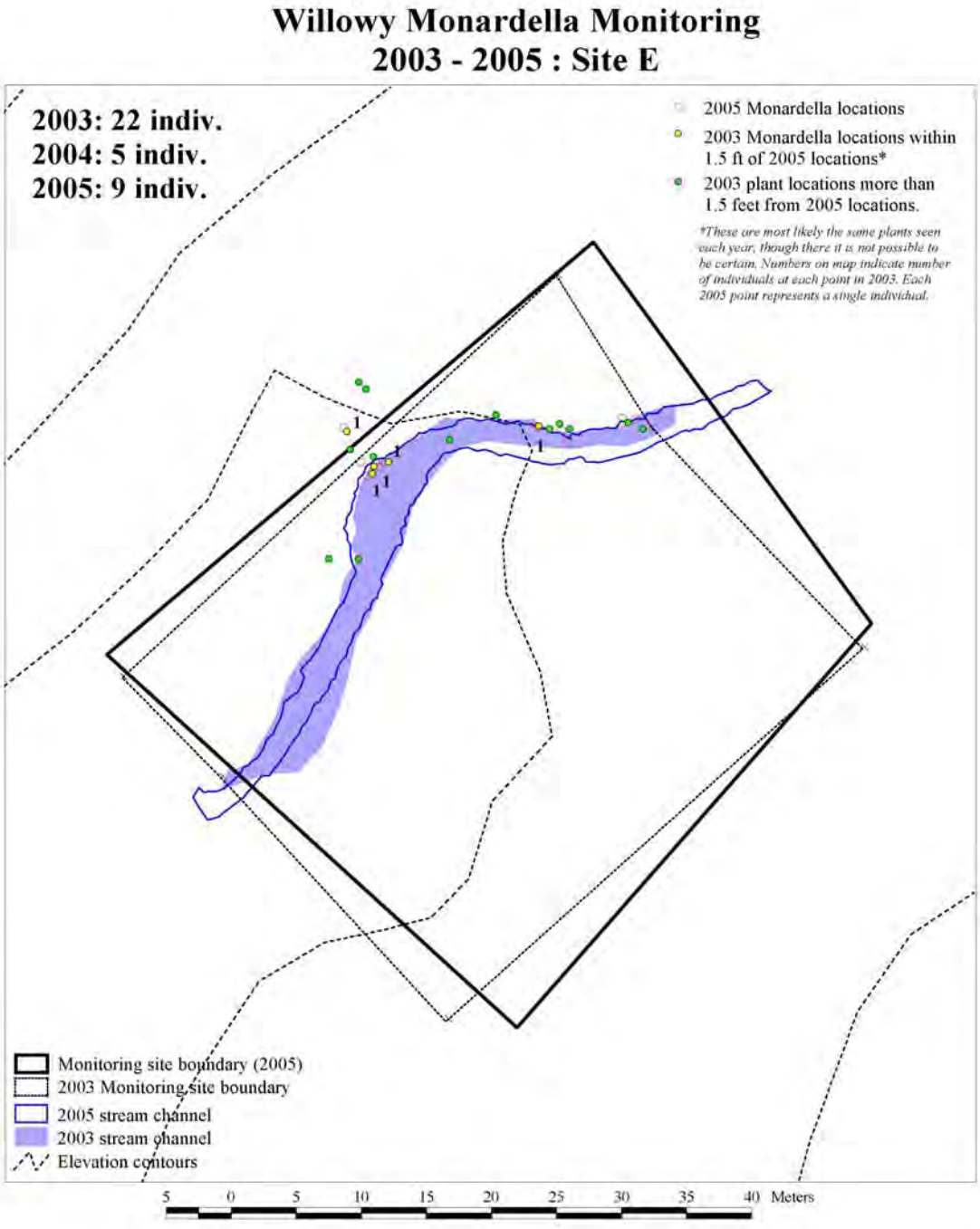
Appendix C. Monitoring Site Maps

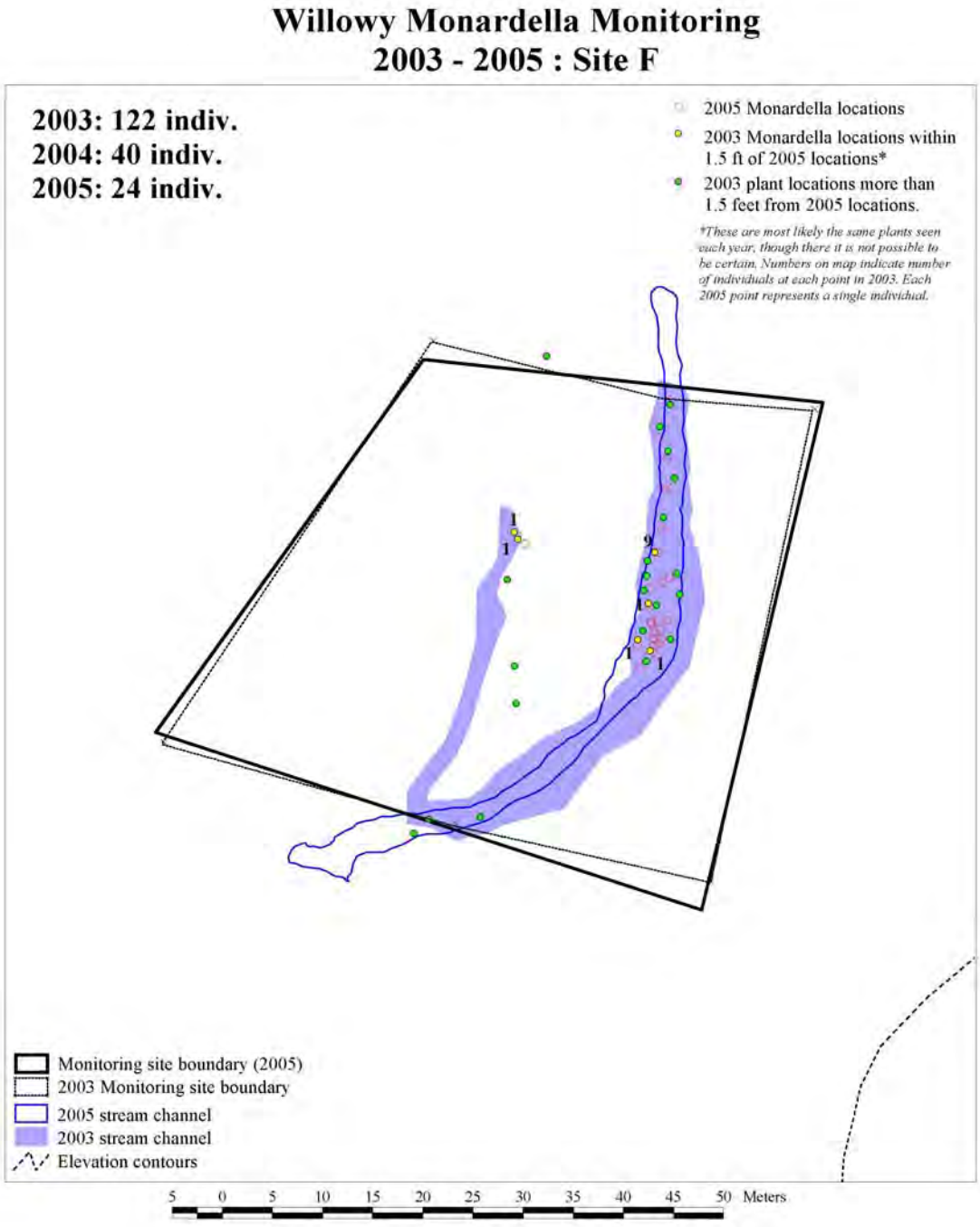

Willowy Monardella Monitoring
2003 - 2005 : Site A
2003: 31 indiv.
2004: 13 indiv.
2005: 16 indiv.
2005 Monardella locations
2003 Monardella locations within 1.5 ft of 2005 locations*
2003 plant locations more than 1.5 feet from 2005 locations.
*These are most likely the same plants seen each year, though there it is not possible to be certain. Numbers on map indicate number of individuals at each point in 2003. Each 2005 point represents a single individual.
This point was not counted as being within the site in 2003 (dotted line). There were 11 plants here, but they are not counted in the data summary.
1
15
8
Monitoring site boundary (2005)
2003 Monitoring site boundary
2005 stream channel
2003 stream channel
Elevation contours
5 0 5 10 15 20 25 30 35 Meters

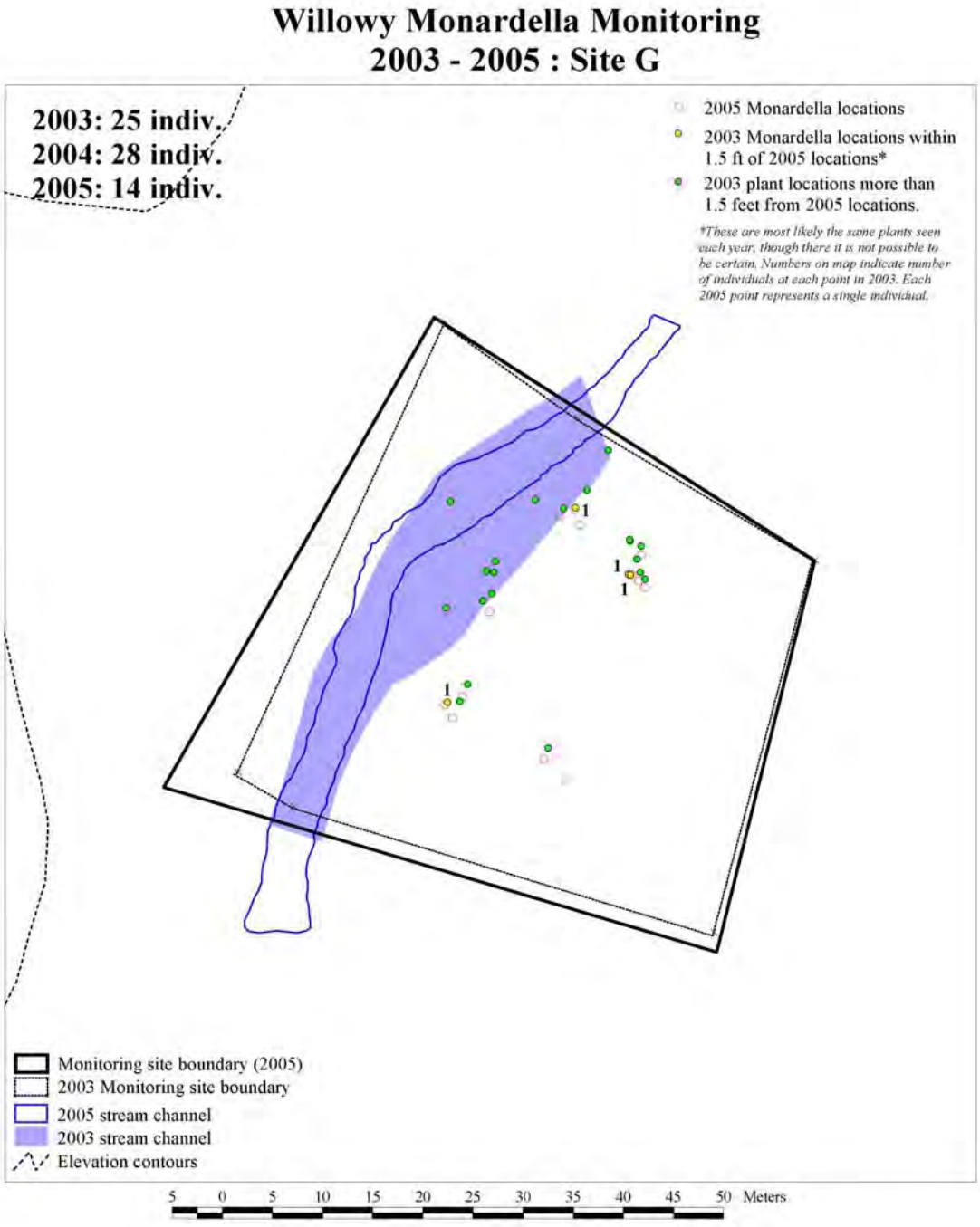

Willowy Monardella Monitoring
2003 - 2005 : Site B
2003: 21 indiv.
2004: 11 indiv.
2005: 4 indiv.
2005 Monardella locations
2003 plant locations more than 1.5 feet from 2005 locations*
*None of the 2003 locations are within 1.5 feet of the 2005 locations.
Monitoring site boundary (2005)
2003 Monitoring site boundary
2005 stream channel
2003 stream channel
Elevation contours
5 0 5 10 15 20 25 30 35 Meters

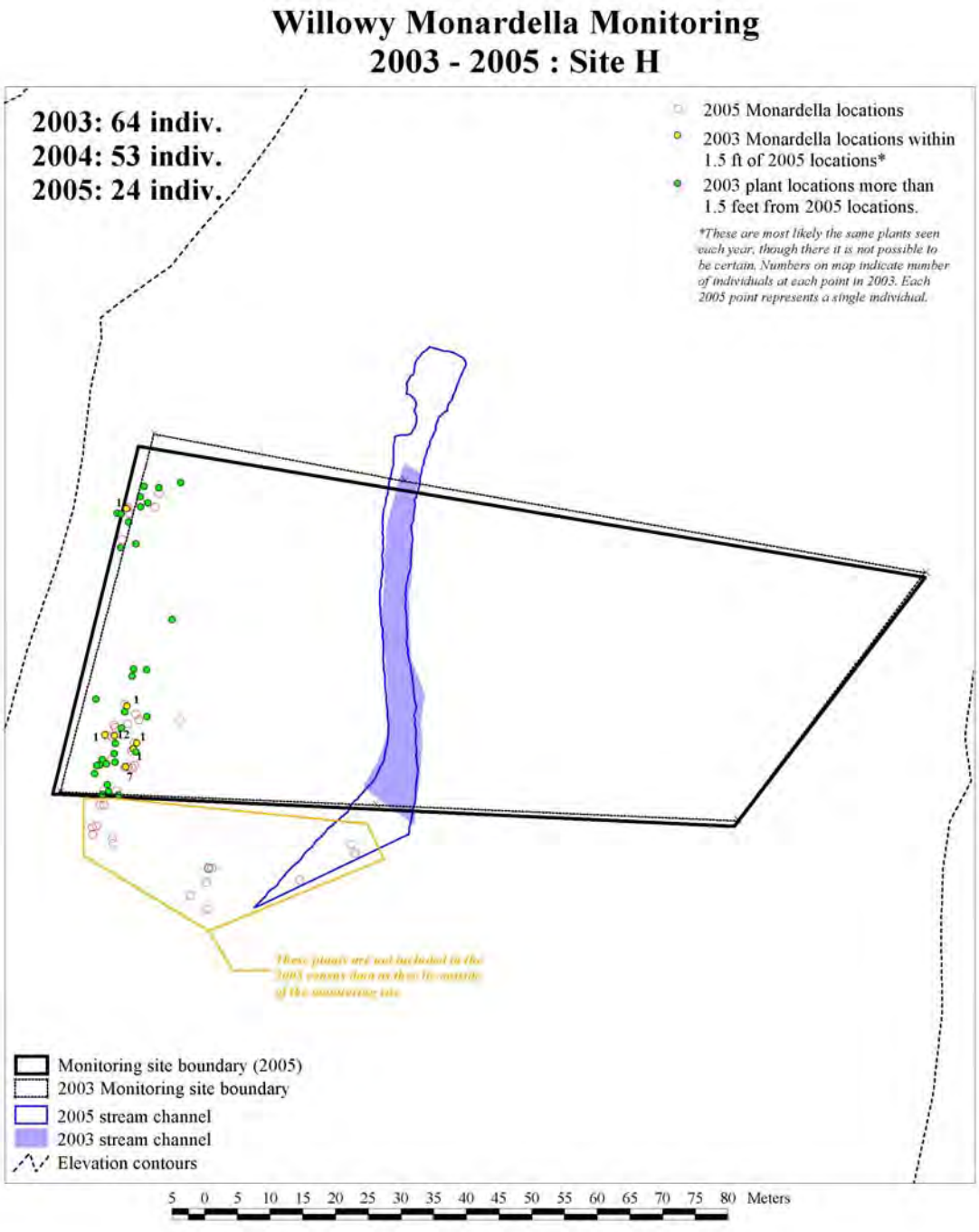

Willowy Monardella Monitoring
2003 - 2005 : Site C
2003: 19 indiv.
2004: 19 indiv.
2005: 4 indiv.
2005 Monardella locations
2003 plant locations more than 1.5 feet from 2005 locations*
*None of the 2003 locations are within 1.5 feet of the 2005 locations.
Monitoring site boundary (2005)
2003 Monitoring site boundary
2005 stream channel
2003 stream channel
Elevation contours
5 0 5 10 15 20 25 30 35 Meters

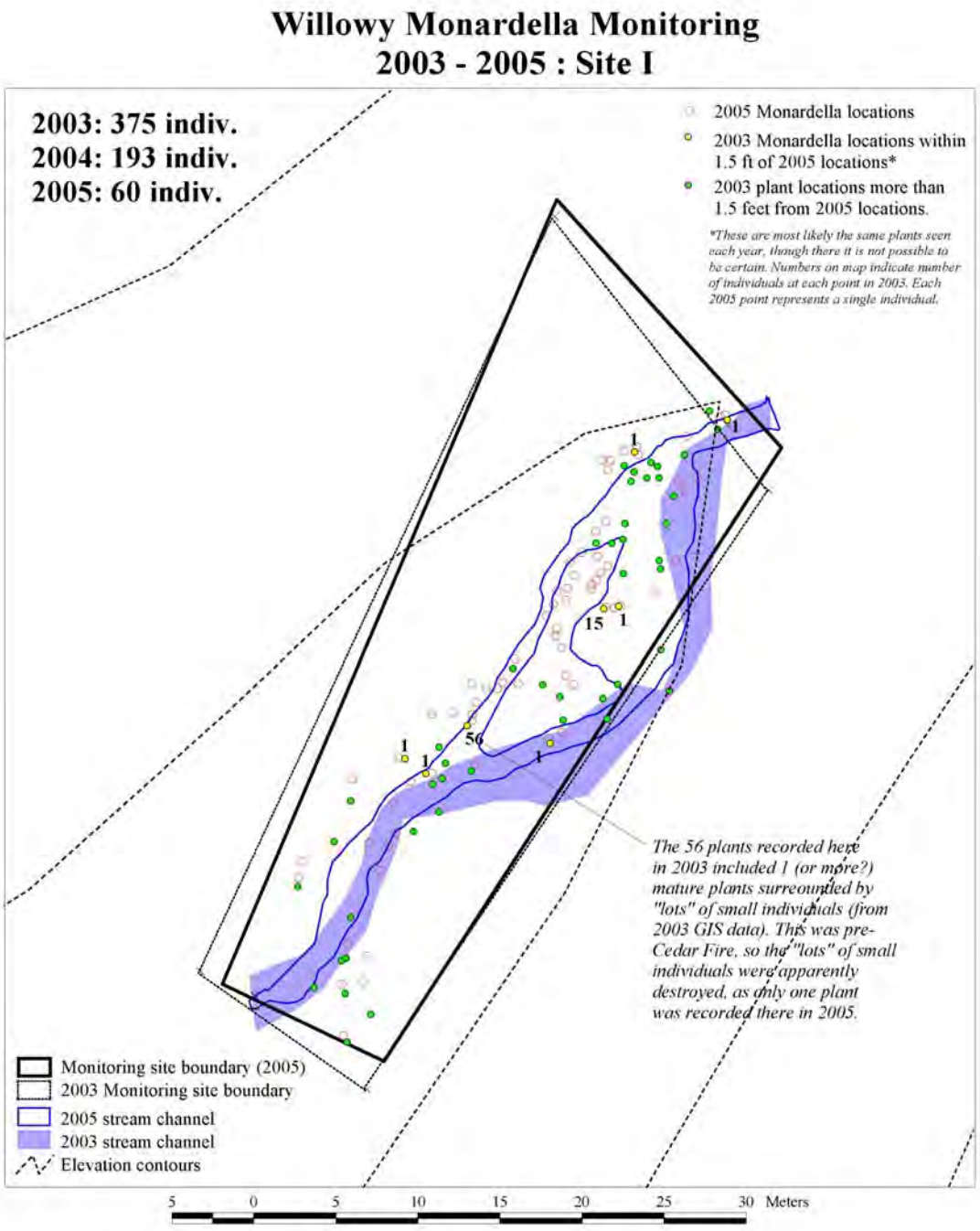

Willowy Monardella Monitoring
2003 - 2005 : Site D
2003: 4 indiv.
2004: 2 indiv.
2005: 1 indiv.
2005 Monardella locations
2003 plant locations more than 1.5 feet from 2005 locations*
*None of the 2003 locations are within 1.5 feet of the 2005 locations.
Monitoring site boundary (2005)
2003 Monitoring site boundary
2005 stream channel
2003 stream channel
Elevation contours
5 0 5 10 15 20 25 30 35 40 Meters

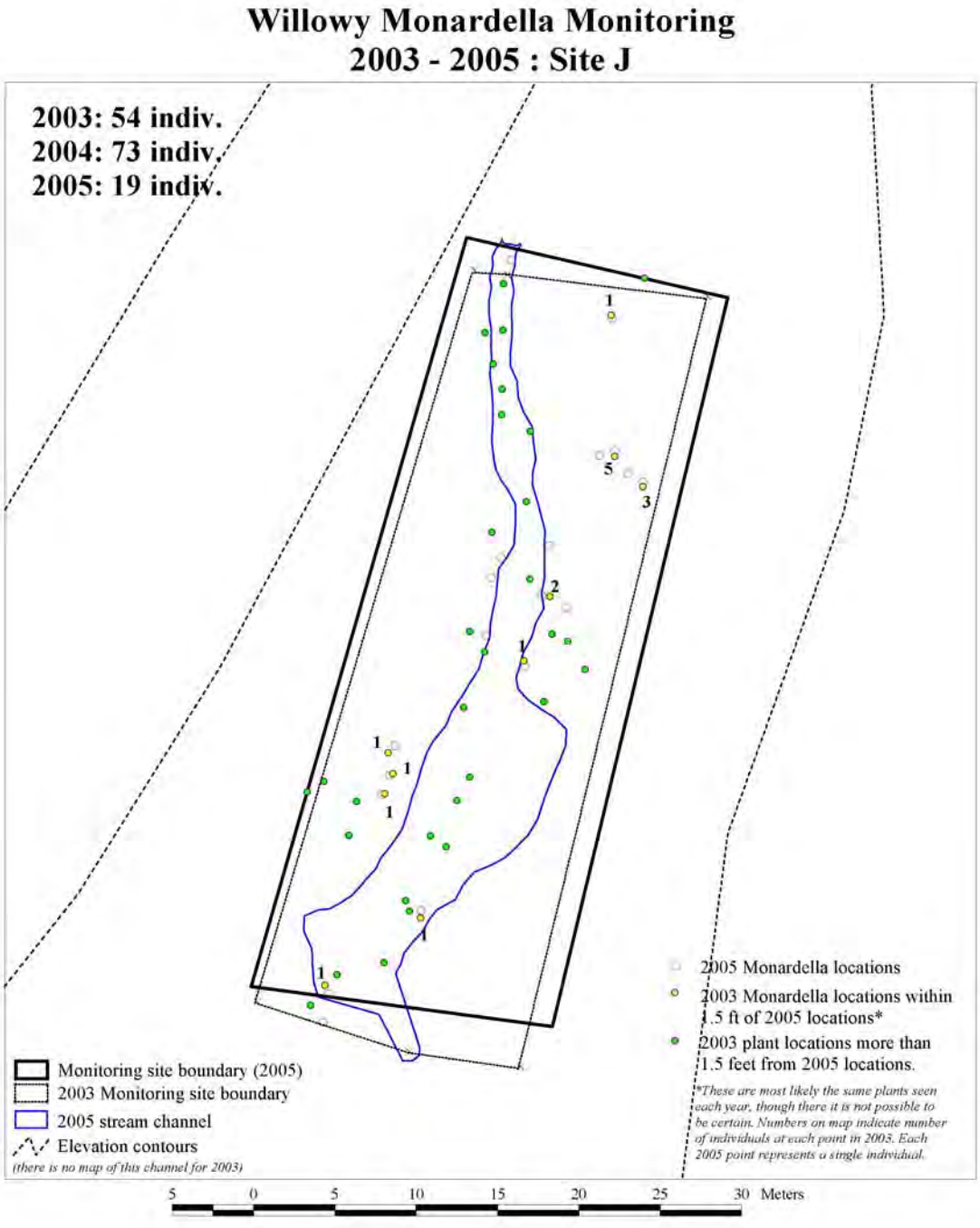

Willowy Monardella Monitoring
2003 - 2005 : Site E
2003: 22 indiv.
2004: 5 indiv.
2005: 9 indiv.
2005 Monardella locations
2003 Monardella locations within 1.5 ft of 2005 locations*
2003 plant locations more than 1.5 feet from 2005 locations.
*These are most likely the same plants seen each year, though there it is not possible to be certain. Numbers on map indicate number of individuals at each point in 2003. Each 2005 point represents a single individual.
Monitoring site boundary (2005)
2003 Monitoring site boundary
2005 stream channel
2003 stream channel
Elevation contours
5 0 5 10 15 20 25 30 35 40 Meters

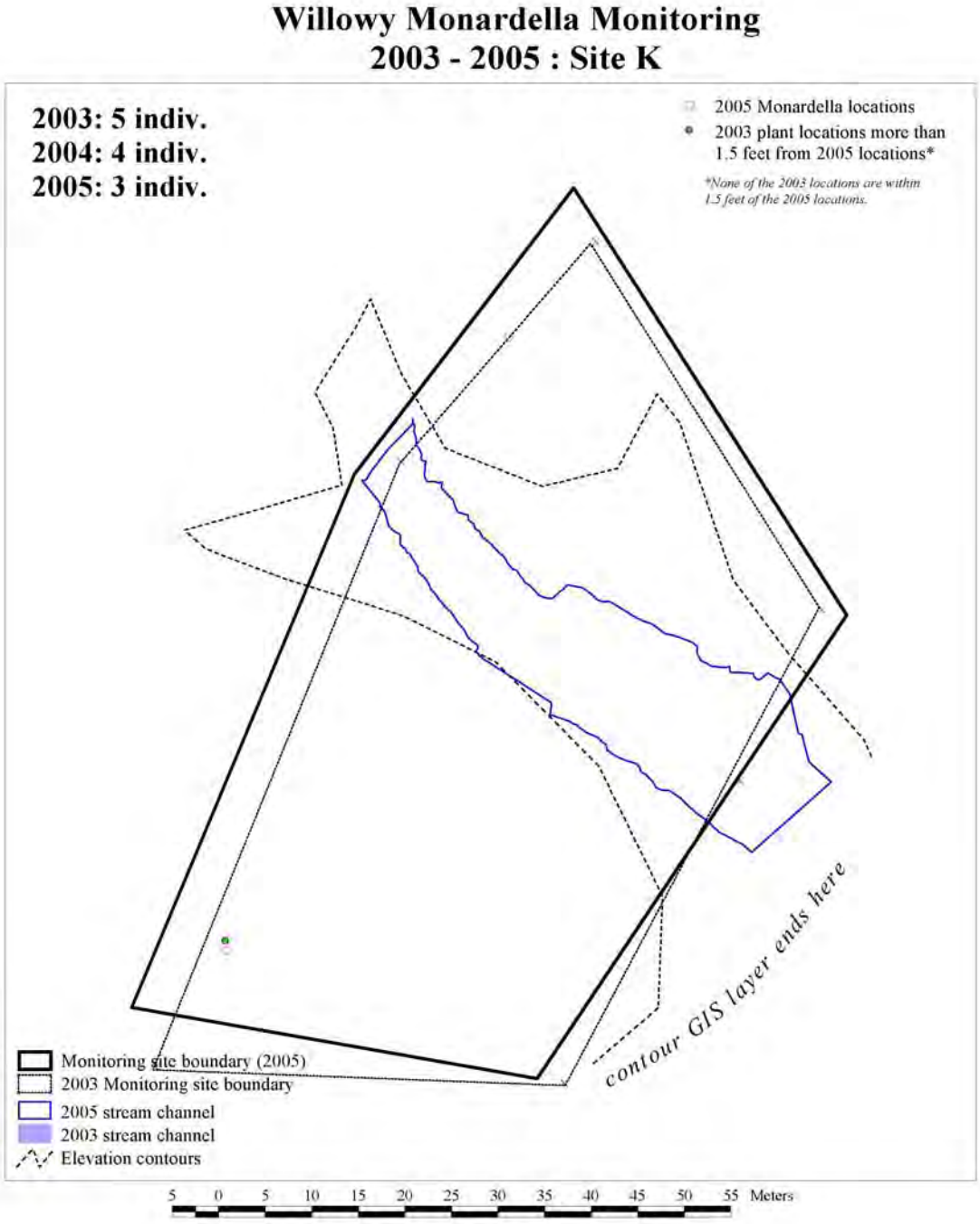

Willowy Monardella Monitoring
2003 - 2005 : Site F
2003: 122 indiv.
2004: 40 indiv.
2005: 24 indiv.
2005 Monardella locations
2003 Monardella locations within 1.5 ft of 2005 locations*
2003 plant locations more than 1.5 feet from 2005 locations.
*These are most likely the same plants seen each year, though there it is not possible to be certain. Numbers on map indicate number of individuals at each point in 2003. Each 2005 point represents a single individual.
1
1
2
1
1
Monitoring site boundary (2005)
2003 Monitoring site boundary
2005 stream channel
2003 stream channel
Elevation contours
5 0 5 10 15 20 25 30 35 40 45 50 Meters

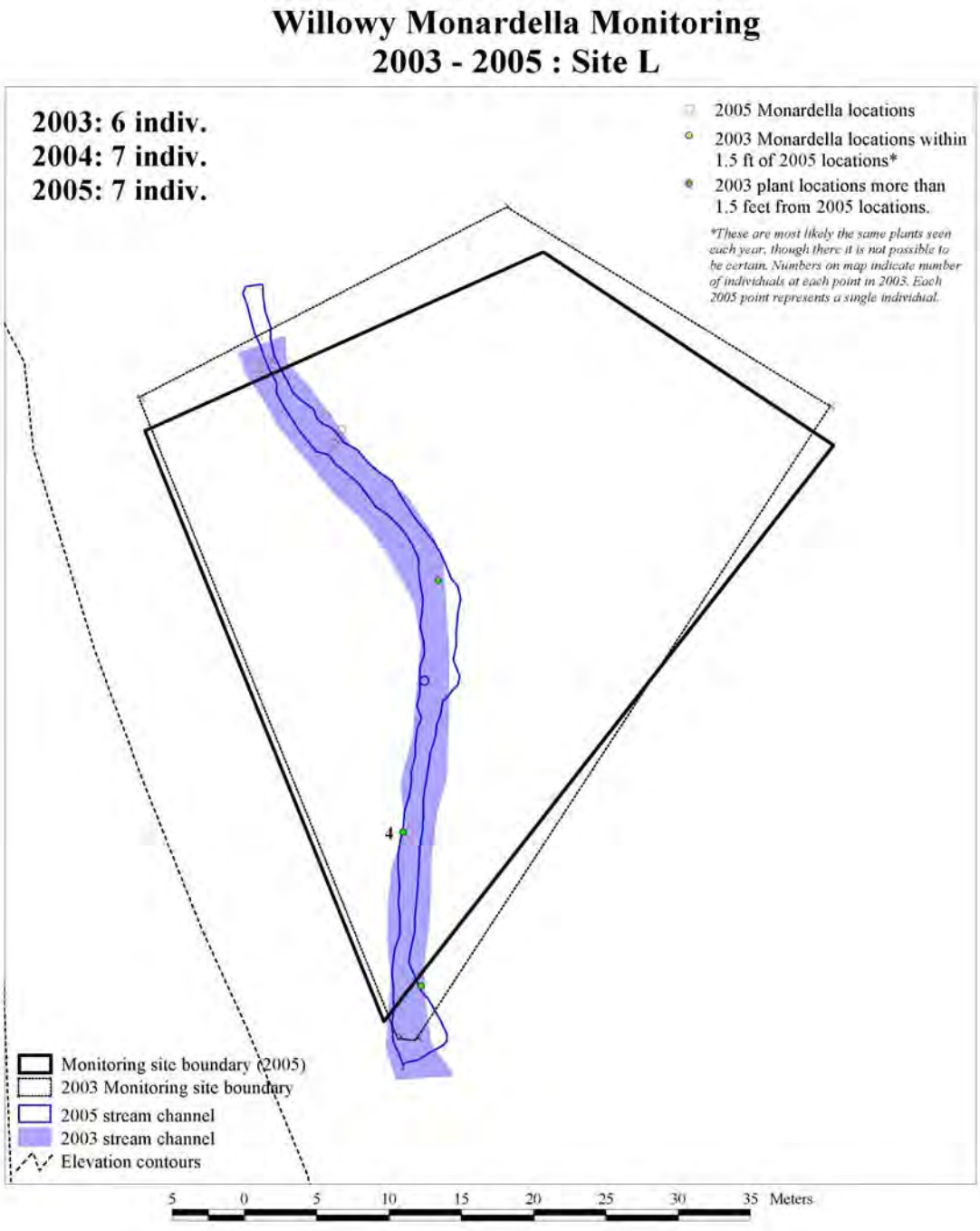

Willowy Monardella Monitoring
2003 - 2005 : Site G
2003: 25 indiv.
2004: 28 indiv.
2005: 14 indiv.
2005 Monardella locations
2003 Monardella locations within 1.5 ft of 2005 locations*
2003 plant locations more than 1.5 feet from 2005 locations.
*These are most likely the same plants seen each year, though there it is not possible to be certain. Numbers on map indicate number of individuals at each point in 2003. Each 2005 point represents a single individual.
1
1
1
1
Monitoring site boundary (2005)
2003 Monitoring site boundary
2005 stream channel
2003 stream channel
Elevation contours
5 0 5 10 15 20 25 30 35 40 45 50 Meters

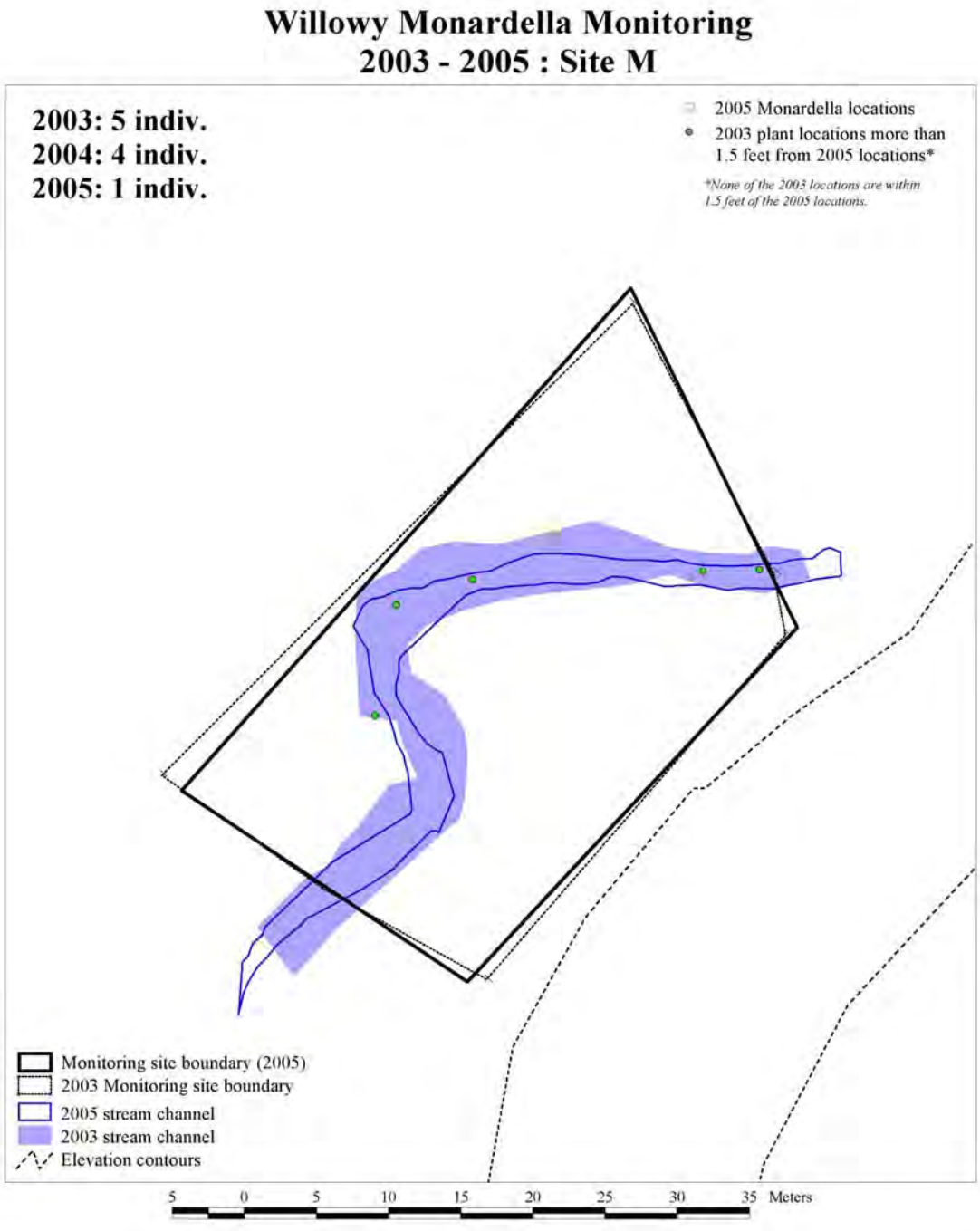

Willowy Monardella Monitoring
2003 - 2005 : Site H
2003: 64 indiv.
2004: 53 indiv.
2005: 24 indiv.
2005 Monardella locations
2003 Monardella locations within 1.5 ft of 2005 locations*
2003 plant locations more than 1.5 feet from 2005 locations.
*These are most likely the same plants seen each year, though there it is not possible to be certain. Numbers on map indicate number of individuals at each point in 2003. Each 2005 point represents a single individual.
These plants are not included in the 2003 census data as they lie outside of the monitoring site.
Monitoring site boundary (2005)
2003 Monitoring site boundary
2005 stream channel
2003 stream channel
Elevation contours
5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 Meters

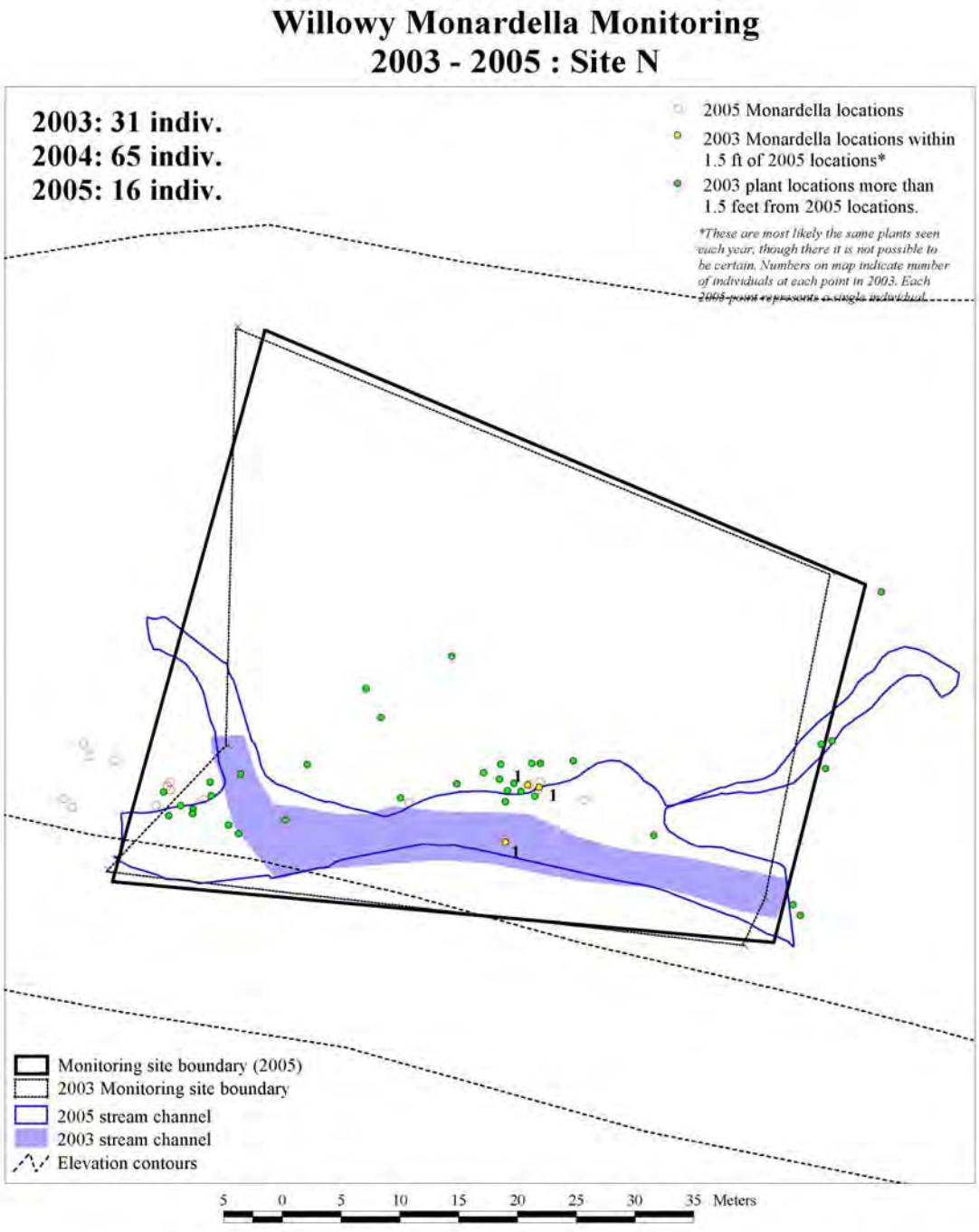

Willowy Monardella Monitoring
2003 - 2005 : Site I
2003: 375 indiv.
2004: 193 indiv.
2005: 60 indiv.
2005 Monardella locations
2003 Monardella locations within 1.5 ft of 2005 locations*
2003 plant locations more than 1.5 feet from 2005 locations.
*These are most likely the same plants seen each year, though there it is not possible to be certain. Numbers on map indicate number of individuals at each point in 2003. Each 2005 point represents a single individual.
1
1
15
1
56
1
1
1
The 56 plants recorded here in 2003 included 1 (or more?) mature plants surreounded by "lots" of small individuals (from 2003 GIS data). This was pre-Cedar Fire, so the "lots" of small individuals were apparently destroyed, as only one plant was recorded there in 2005.
Monitoring site boundary (2005)
2003 Monitoring site boundary
2005 stream channel
2003 stream channel
Elevation contours
5 0 5 10 15 20 25 30 Meters

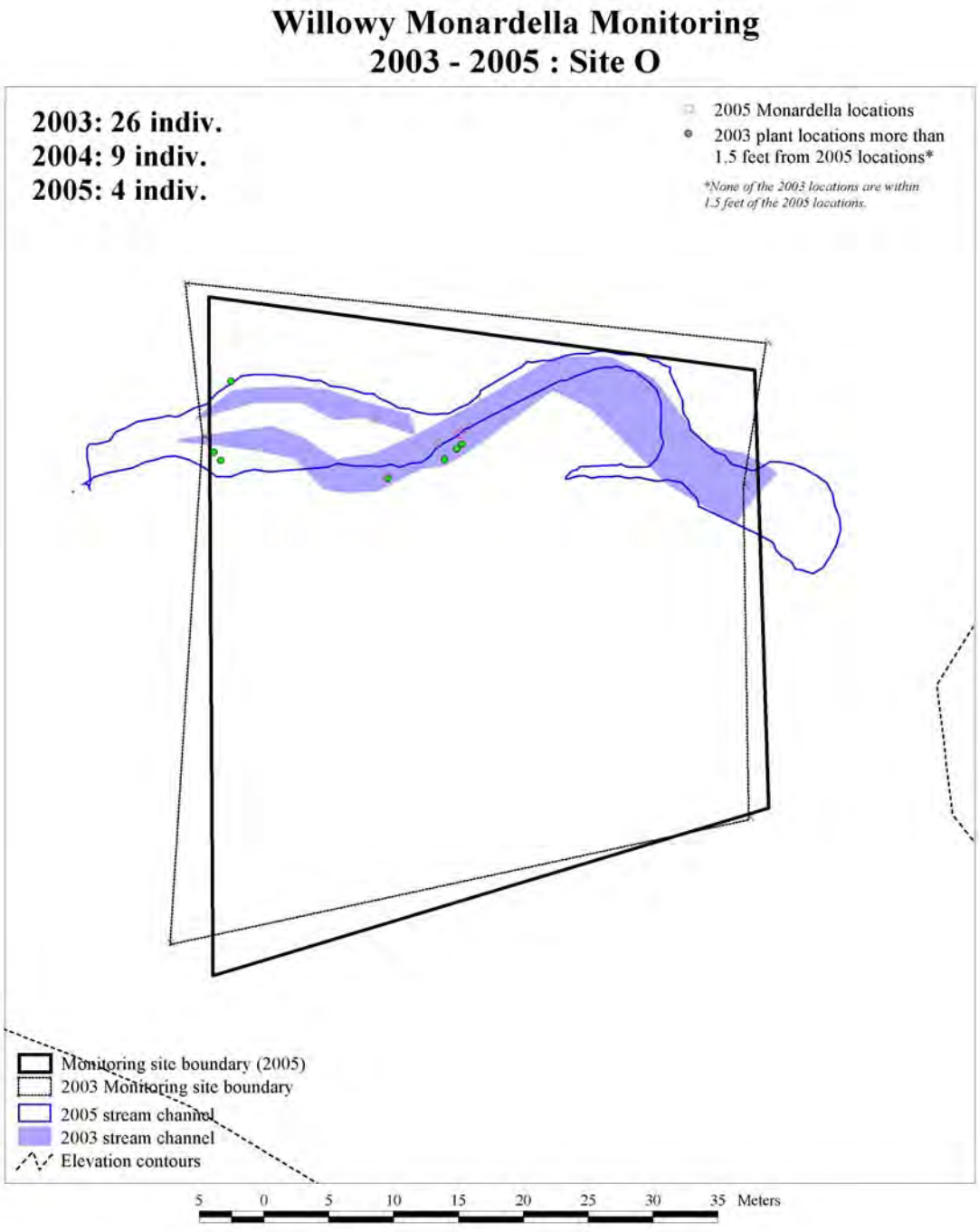

Willowy Monardella Monitoring
2003 - 2005 : Site J
2003: 54 indiv.
2004: 73 indiv.
2005: 19 indiv.
1
5
3
2
1
1
1
1
1
1
2005 Monardella locations
2003 Monardella locations within 1.5 ft of 2005 locations*
2003 plant locations more than 1.5 feet from 2005 locations.
*These are most likely the same plants seen each year, though there it is not possible to be certain. Numbers on map indicate number of individuals at each point in 2003. Each 2005 point represents a single individual.
Monitoring site boundary (2005)
2003 Monitoring site boundary
2005 stream channel
Elevation contours
(there is no map of this channel for 2003)
5 0 5 10 15 20 25 30 Meters


Willowy Monardella Monitoring
2003 - 2005 : Site K
2003: 5 indiv.
2004: 4 indiv.
2005: 3 indiv.
2005 Monardella locations
2003 plant locations more than 1.5 feet from 2005 locations*
*None of the 2003 locations are within 1.5 feet of the 2005 locations.
contour GIS layer ends here
Monitoring site boundary (2005)
2003 Monitoring site boundary
2005 stream channel
2003 stream channel
Elevation contours
5 0 5 10 15 20 25 30 35 40 45 50 55 Meters


Willowy Monardella Monitoring
2003 - 2005 : Site L
2003: 6 indiv.
2004: 7 indiv.
2005: 7 indiv.
2005 Monardella locations
2003 Monardella locations within 1.5 ft of 2005 locations*
2003 plant locations more than 1.5 feet from 2005 locations.
*These are most likely the same plants seen each year, though there it is not possible to be certain. Numbers on map indicate number of individuals at each point in 2003. Each 2005 point represents a single individual.
4
Monitoring site boundary (2005)
2003 Monitoring site boundary
2005 stream channel
2003 stream channel
Elevation contours
5 0 5 10 15 20 25 30 35 Meters


Willowy Monardella Monitoring
2003 - 2005 : Site M
2003: 5 indiv.
2004: 4 indiv.
2005: 1 indiv.
2005 Monardella locations
2003 plant locations more than 1.5 feet from 2005 locations*
*None of the 2003 locations are within 1.5 feet of the 2005 locations.
Monitoring site boundary (2005)
2003 Monitoring site boundary
2005 stream channel
2003 stream channel
Elevation contours
5 0 5 10 15 20 25 30 35 Meters


Willowy Monardella Monitoring
2003 - 2005 : Site N
2003: 31 indiv.
2004: 65 indiv.
2005: 16 indiv.
2005 Monardella locations
2003 Monardella locations within 1.5 ft of 2005 locations*
2003 plant locations more than 1.5 feet from 2005 locations.
*These are most likely the same plants seen each year, though there it is not possible to be certain. Numbers on map indicate number of individuals at each point in 2003. Each 2003 point represents a single individual.
1
1
1
Monitoring site boundary (2005)
2003 Monitoring site boundary
2005 stream channel
2003 stream channel
Elevation contours
5 0 5 10 15 20 25 30 35 Meters


Willowy Monardella Monitoring
2003 - 2005 : Site O
2003: 26 indiv.
2004: 9 indiv.
2005: 4 indiv.
2005 Monardella locations
2003 plant locations more than 1.5 feet from 2005 locations*
*None of the 2003 locations are within 1.5 feet of the 2005 locations.
Monitoring site boundary (2005)
2003 Monitoring site boundary
2005 stream channel
2003 stream channel
Elevation contours
5 0 5 10 15 20 25 30 35 Meters

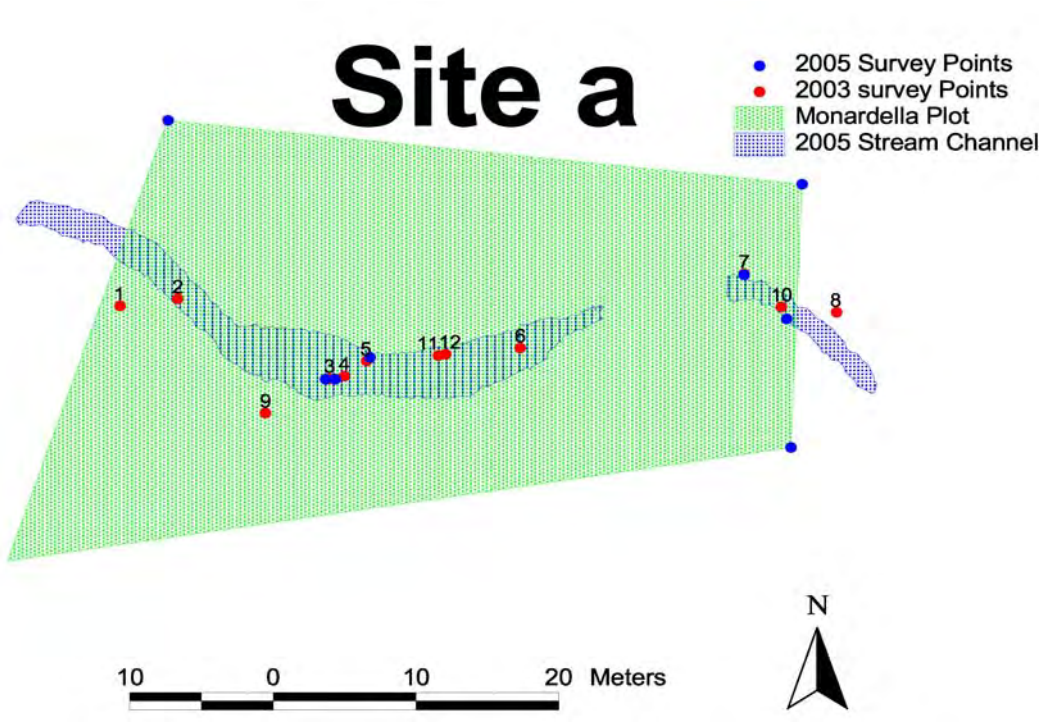
Appendix D: December 14, 2005 Site Revisit

December 14, 2005 Site Revisit

Four sites were revisited on December 14, 2005 to verify and investigate further the absence of plants found during the field surveys in August 2005. This appendix documents the plant loss and observations made during the December 14 visit. Two Trimble GPS Units were taken to the revisited plots, one loaded with 2003 data points and the other with 2005 data points. One live plant was observed that had been missed in 2005, and some dead plants were documented, however, others were simply missing. The missed live plant and dead plants were usually hidden by dense *Avena fatua* and had to be unburied to be located. Many other plants are missing (as documented in the photos), apparently due to scouring and deposition caused by flooding during the previous season. Some plants located in 2005 were not documented in 2003. A single live individual located with a GPS unit in August was (already) missing in December. It had been growing near a road culvert.

Site A Data Summary

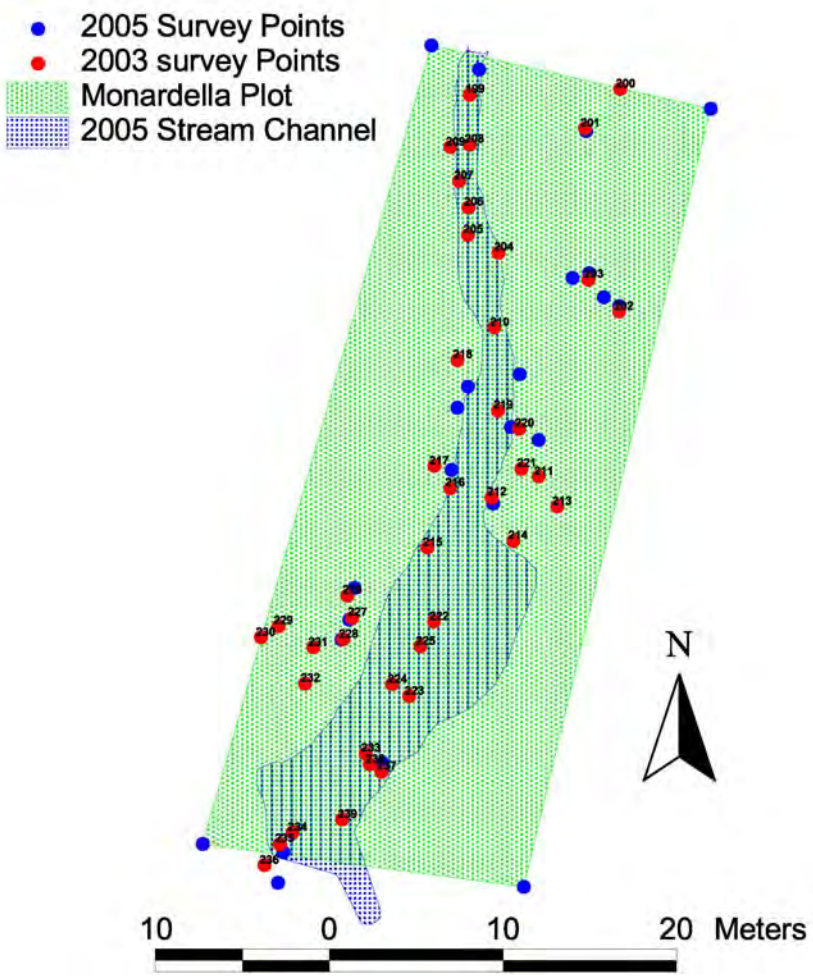
2003 Plant ID	2005 Plant ID	Condition
1		very large but dead plant- 2nd plot dead plant not recognized.
2		small dead plant under grass-too small had to know where to look
3	98	found 2005
4	99	found 2005
5	100	found 2005
6		missing, middle of stream scoured away
7		found August 2005 but gone December 2005. Was near a road culvert
8		missing, replaced with Avena fatua
9		missing, replaced with Avena fatua
10	97	found 2005
11		missing, middle of stream scoured away
12		missing, middle of stream scoured away



Site J Data Summary

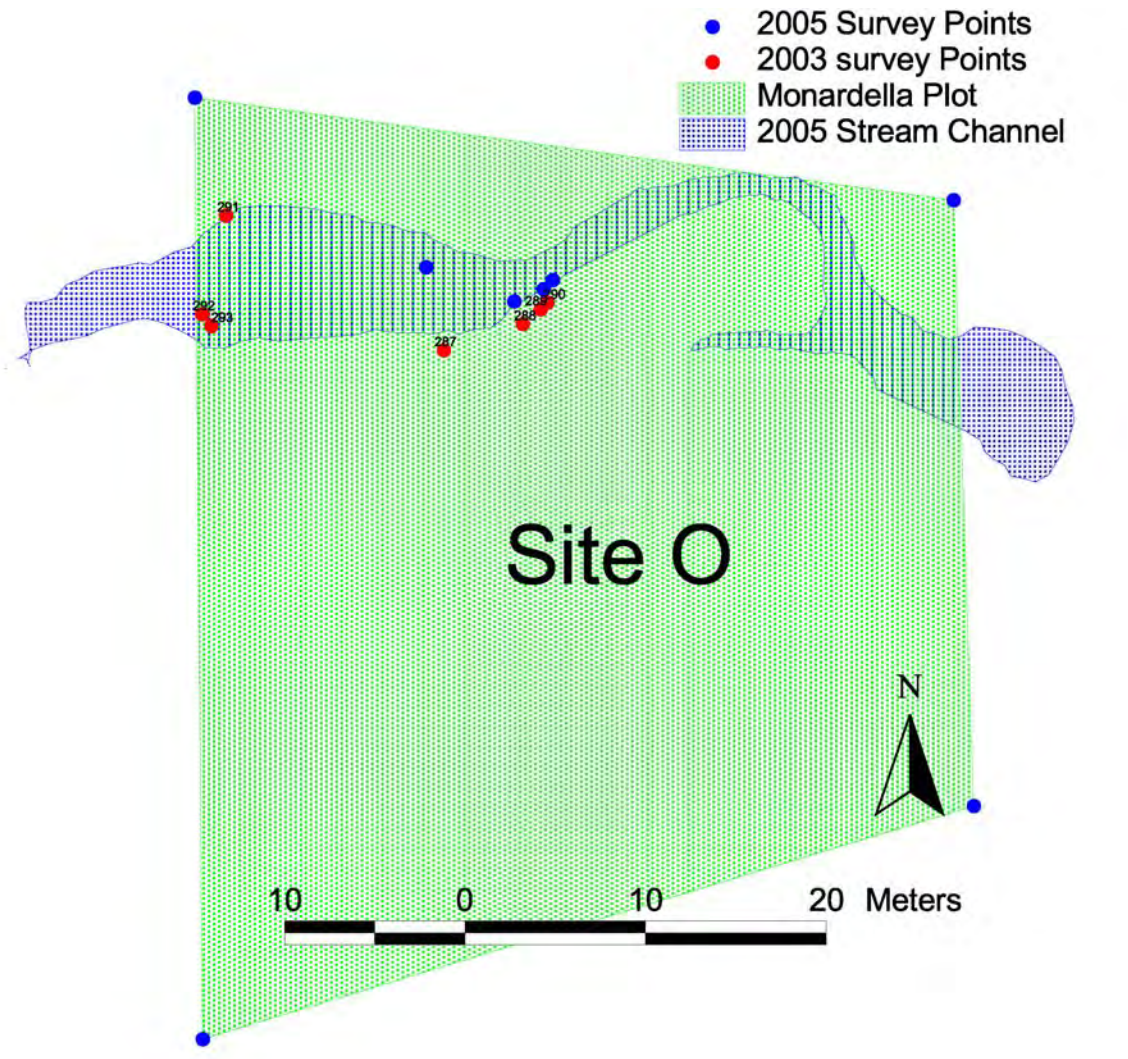
2003 Plant ID	2005 Plant ID	Condition
199	171	found 2005
200		missing, replaced with Avena fatua
201	175	found 2005
202	178	found 2005
203	176	found 2005
204		missing, Avena
205		missing, middle of stream scoured away
206		missing, middle of stream scoured away
207		missing, middle of stream scoured away
208		missing, middle of stream scoured away
209		missing, middle of stream scoured away
210		missing, middle of stream scoured away
211		missing, replaced with Avena fatua
212	165	found 2005
213		missing, replaced with Avena fatua
214		missing, replaced with Avena fatua
215		missing, middle of stream or bank erosion
216		missing, replaced with Avena fatua
217	166	found 2005
218	169	found 2005
219		missing, middle of stream scoured away
220		We missed this one 2005
221		missing, replaced with Avena fatua
222		missing, middle of stream scoured away
223		missing, middle of stream scoured away
224		missing, middle of stream scoured away
225		missing, middle of stream scoured away
226	172	found 2005
227	173	found 2005
228	174	found 2005
229		missing, gone replaced with Avena fatua
230		missing, gone replaced with Avena fatua
231		missing, gone replaced with Avena fatua
232		missing, gone replaced with Avena fatua
233	164?	found 2005
234		missing, middle of stream scoured away
235	163	found 2005
236	162	found 2005
237	164	found 2005
238	164	found 2005
239		missing, middle of stream scoured away
none	180	NEW not found 2003
		1 live missed 1 new plant discovered

Site J


2005 Survey Points
2003 survey Points
Monardella Plot
2005 Stream Channel
N
10 0 10 20 Meters

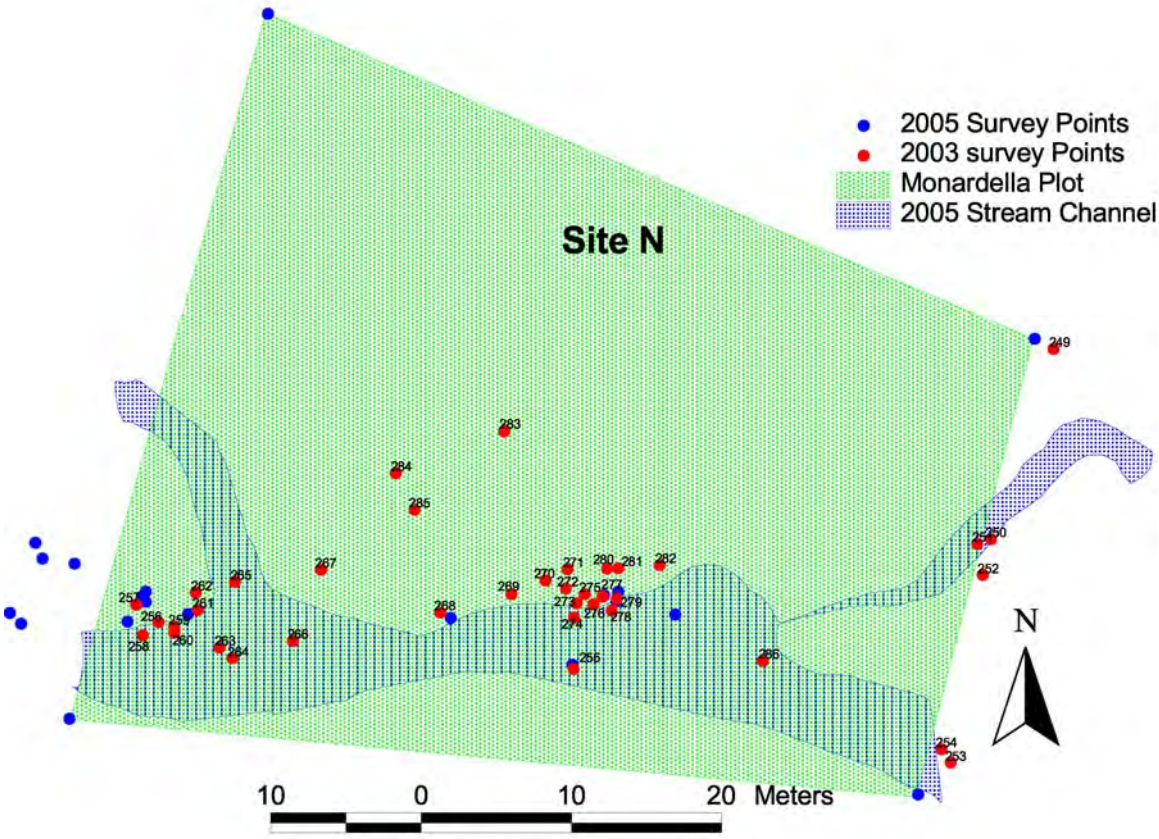
Site O Data Summary

2003 Plant ID	2005 Plant ID	Condition
287		very small and dead
288	117	found 2005
290	119	found 2005
291		Very small- missed 2005 survey (on site plot line)
292		missing, middle of stream scoured away
293		missing, middle of stream scoured away
		1 dead +1 live missed (on plot line)



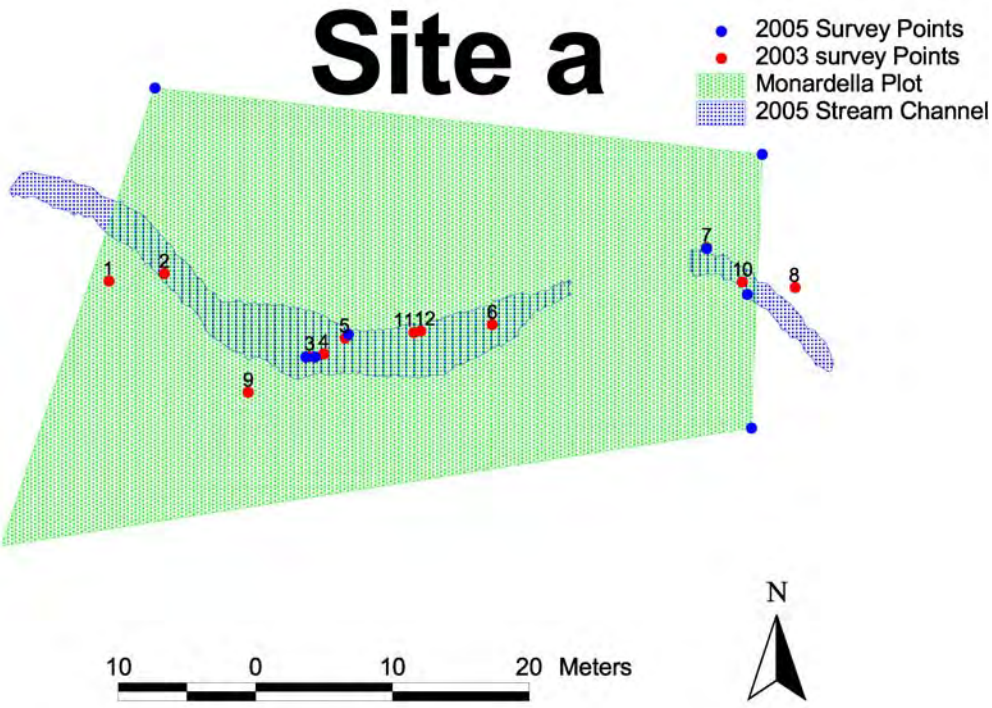
Site N Data Summary

2003 Plant ID	2005 Plant ID	Condition
253		missing, middle of stream scoured away
254		no specific photo see above
255	123	Found 2005
256		missing, bank erosion
257	129-131	Found 2005
258	132	Found 2005
259		missing, bank erosion
260		missing, bank erosion
261	128	Found 2005
262		missing, replaced with Avena fatua
263		missing, 1.5 2 inch sand deposit
264		missing, 1.5 2 inch sand deposit
265		missing, middle of stream scoured away
266		missing, 1.5 2 inch sand deposit
267		missing, replaced with Avena fatua
268		missing, 1.5 2 inch sand deposit
269		missing, 1.5 2 inch sand deposit
270		missing, 1.5 2 inch sand deposit
271		missing, 1.5 2 inch sand deposit
272		missing, 1.5 2 inch sand deposit
273		dead but there
273		missing, 1.5 2 inch sand deposit
274		missing, middle of stream scoured away
274		missing, 1.5 2 inch sand deposit
275		missing, 1.5 2 inch sand deposit
276		dead but there-sand deposit
277	126	Found 2005
279?	124	Found 2005
279	125	Found 2005
280		missing, 1.5 2 inch sand deposit
281		missing, 1.5 2 inch sand deposit
282		missing, 1.5 2 inch sand deposit
286		missing, middle of stream scoured away
		2 dead not found


2005 Survey Points
2003 survey Points
Monardella Plot
2005 Stream Channel
Site N
N
10 0 10 20 Meters

Sites A & J Photo Log From Revisit December 14, 2005

(Plant numbers used in captions are internal to 2005 photo log. Those in parentheses refer to 2003 plant identification numbers recorded on the 2003 GPS. White shoes in photos are 2005 locations, gray shoes are 2003 locations.)



Plant (1) – Very large, dead plant.

Plant (2) – Small dead plant under grass.

Plants (3) 98 and (4) 99 – Relocated 2005.

Plant (5) 100 – Relocated 2005.

Relocated plant (5) 100.

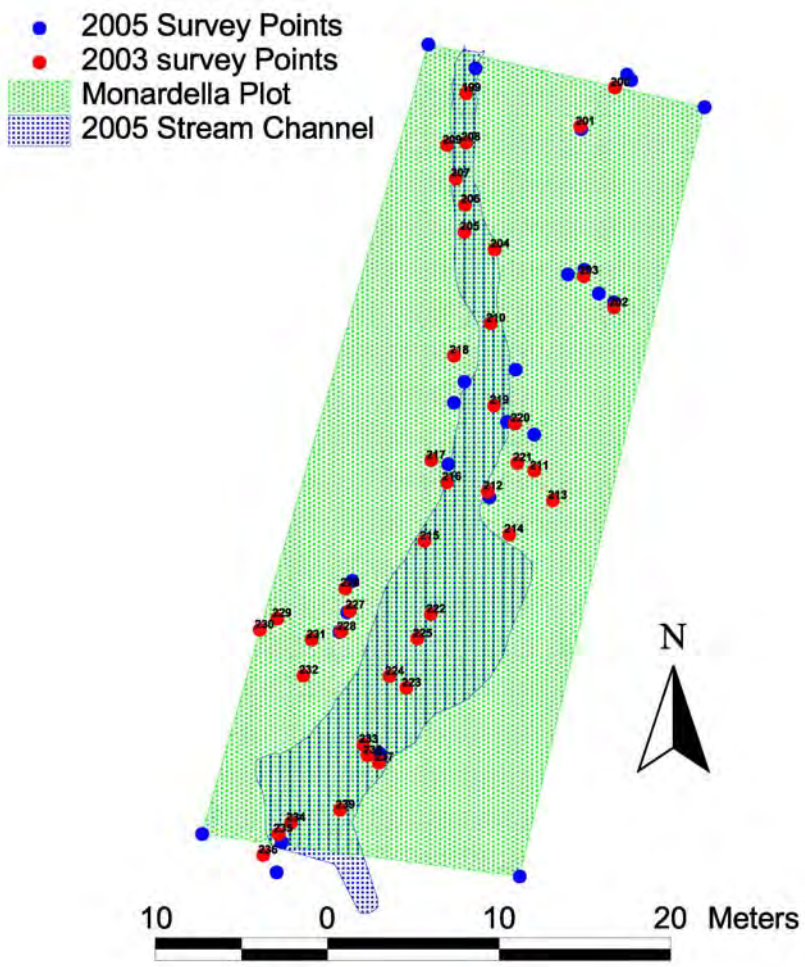
Plant (6) – Missing, scour.

Plant (8) – Missing, replaced with *Avena fatua*.

Plant (9) – Missing, replaced with *Avena fatua*.

Plant (10) 97 – Relocated 2005.

Plants (11 and 12) – Missing, due to scour.


2005 Survey Points
2003 survey Points
Monardella Plot
2005 Stream Channel
N
10
0
10
20 Meters

Site J

Plant (234) Lost label.

Plant (212) 165 – Relocated 2005.

Relocated 162 (236).

Relocated 168(218).

Relocated 170(maybe 219).

New 180 – Not found in 2003.

Plant 253 – Missed this one in August 2005, relocated December.
Could be missing plant (200.)

Plant (199) 171 – Relocated 2005.

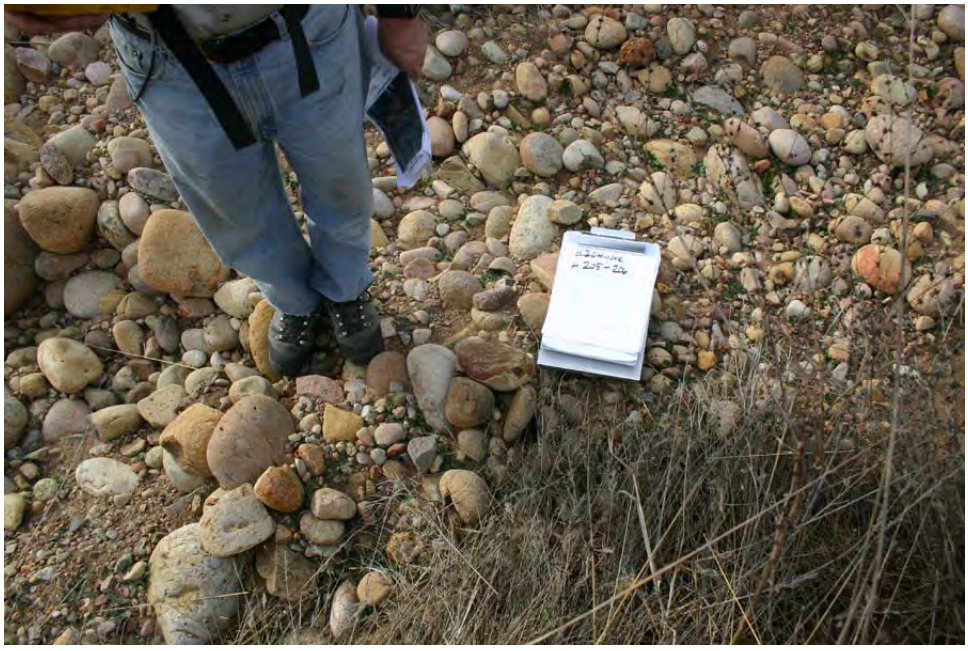
Plant 200 – Missing, replaced with *Avena fatua.*

Plant (201) 175 – Relocated 2005.

Plant (202) 178 – Relocated 2005.

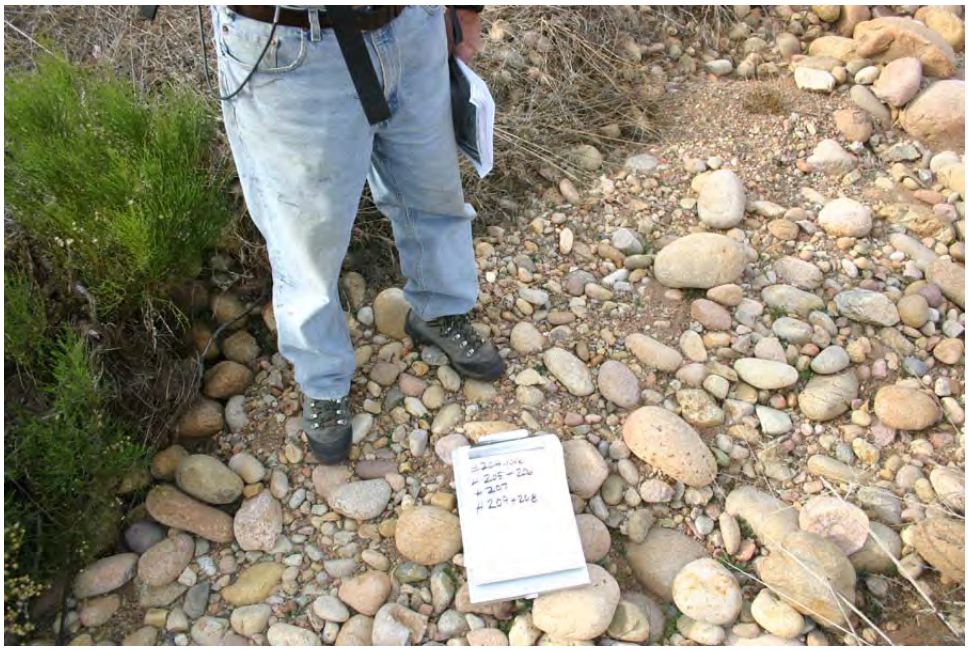
Plant (203) 176 – Relocated 2005.

Plant (204) – Missing, replaced with *Avena fatua.*



Plants (205 & 206) – Missing, scour.

Plant (207) – Missing, scour.



Plant (208 & 209) – Missing, scour.

Plant (210) – Missing, scour.

Plant (211) – Missing, scour.

Plant (213) – Missing, replaced with *Avena fatua.*

Plant (214) – Missing, replaced with *Avena fatua.*

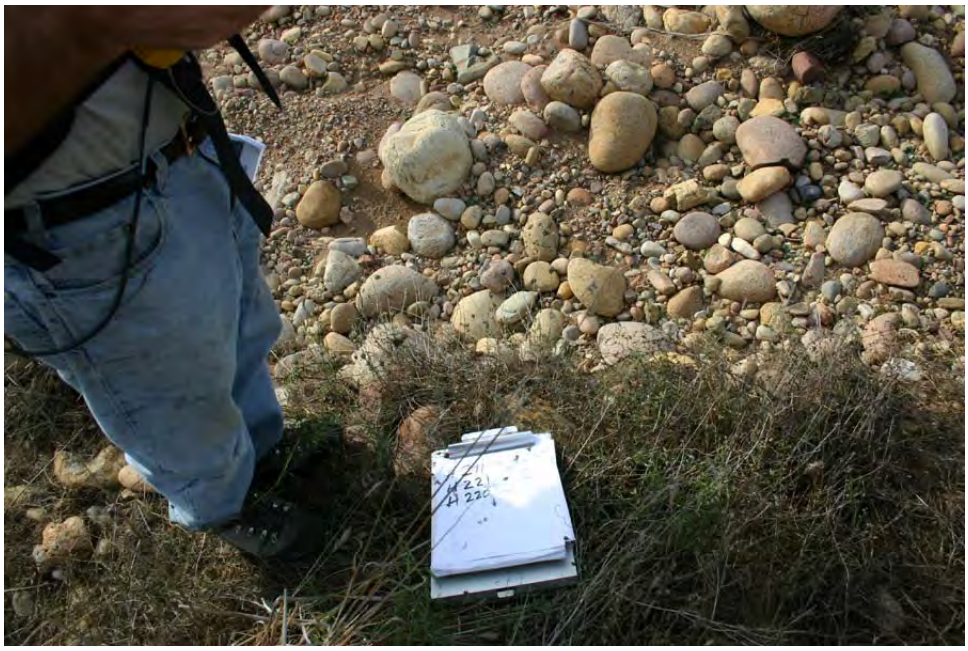
Plant (215)- Missing, scour or bank erosion.

Plant (216) – Missing, replaced with *Avena fatua.*

Plant (217) 166 – Relocated 2005.

Plant (218) 169 – Relocated 2005.

Plant (219) – Missing, scour.



Plant (220) – Missed this one in August 2005, relocated December.

Plant (221) – Missing, replaced with *Avena fatua.*

Plants (223 & 224) – Missing, scour.

Plant (227) 173 – Relocated 2005.

Plant (228) 174 – Relocated 2005.

Plants (229 & 230) – Missing, replaced with *Avena fatua.*

Plant (231) – Missing, replaced with *Avena fatua.*

Plant (232) – Missing, replaced with *Avena fatua.*

Plant (234) – Missing, scour.

Plant (235) 162 – Relocated 2005.

Plant (236) – Relocated 2005.

Plant (239) – Missing, scour.

Plants (222 & 225) – Missing, scour.

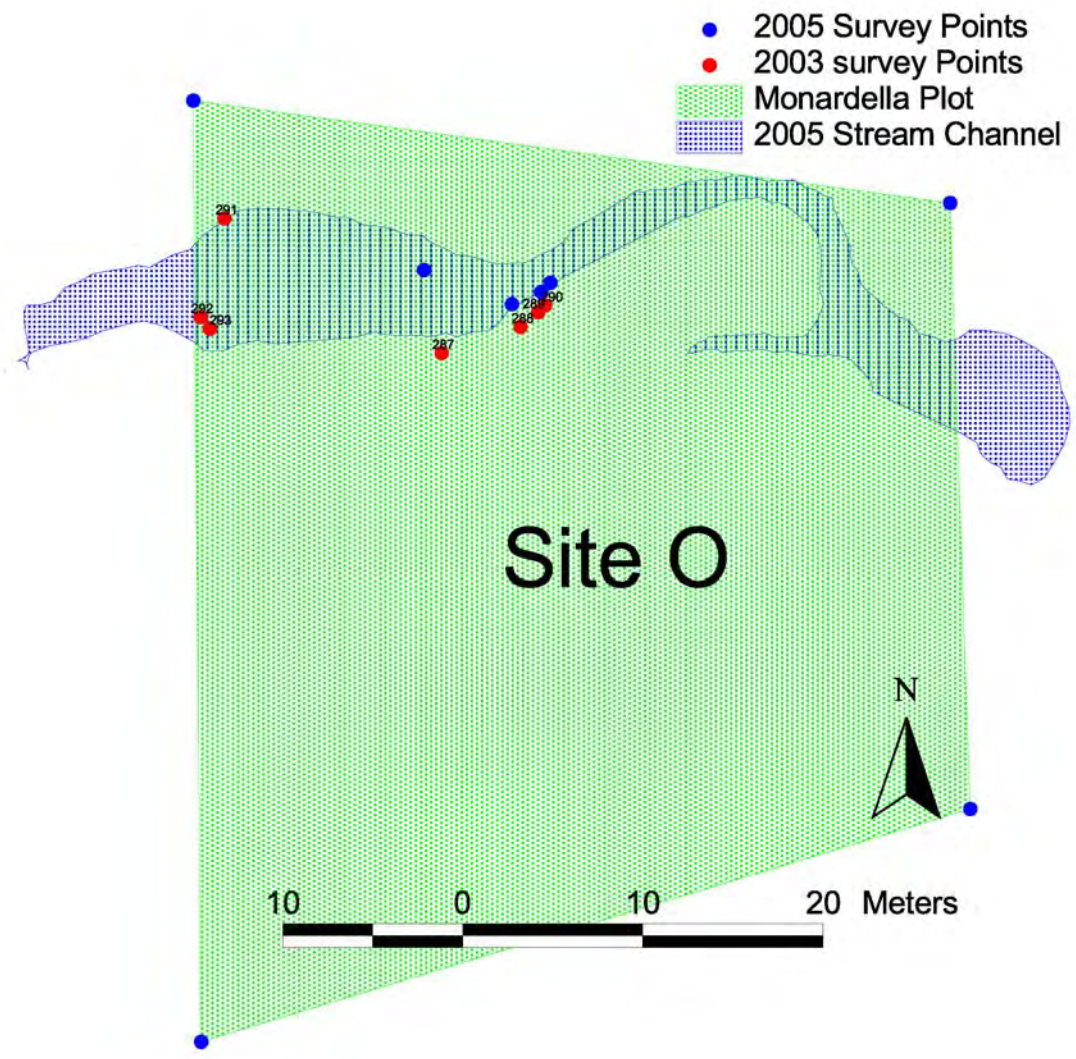
Plants (223 & 224) – Missing, scour.

Plant (226) 172 – Relocated 2005.

Plants (238, 237 & 233) 164 – Relocated 2005.

Sites O & N Photo Log From Revisit December 14, 2005

(Plant numbers used in captions are internal to 2005 photo log. Those in parentheses refer to 2003 plant identification numbers recorded on the 2003 GPS. White shoes in photos are 2005 locations, gray shoes are 2003 locations.)



Plant (293) – Missing, scour.

Relocated plants (289) 88? & (290) 117? & 119– 2005.

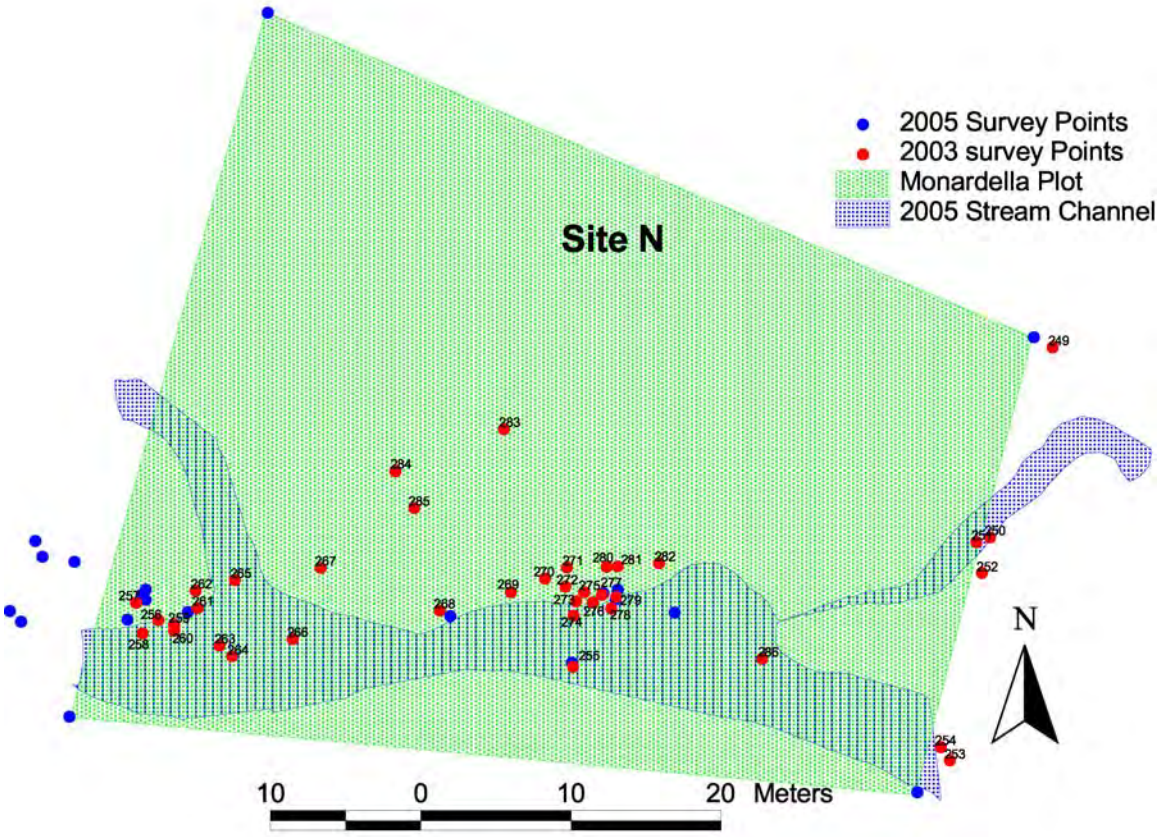
Plant (287) – Dead.

Plant (291) – Very small; missed in August 2005 survey, relocated December.

Plant (292) – Missing, scour.

Plant (293) – Missing, scour.

Plants (288) 117 & (290) 119 – Relocated 2005.


2005 Survey Points
2003 survey Points
Monardella Plot
2005 Stream Channel
Site N
N
10 0 10 20 Meters

Plant 124 (279) & 126 (277) – Relocated 2005.

New in 2005. 122 – no previous record.

Plant (253) – Missing, scour.

Plant (255) 123 – Relocated 2005.

Plant (256) – Missing, bank erosion.

Plant (257) 129-131 – Relocated 2005.

Plant (258) 132 – Relocated 2005.

Plant (261) 128 – Relocated 2005.

Plant (262) – Missing, replaced with *Avena fatua.*

Plant (265) – Missing, scour.

Plant (266) – Missing, scour.

Plant (267) – Missing, replaced with *Avena fatua.*

Plant (268) - Missing, 1.5 – 2” sand deposit.

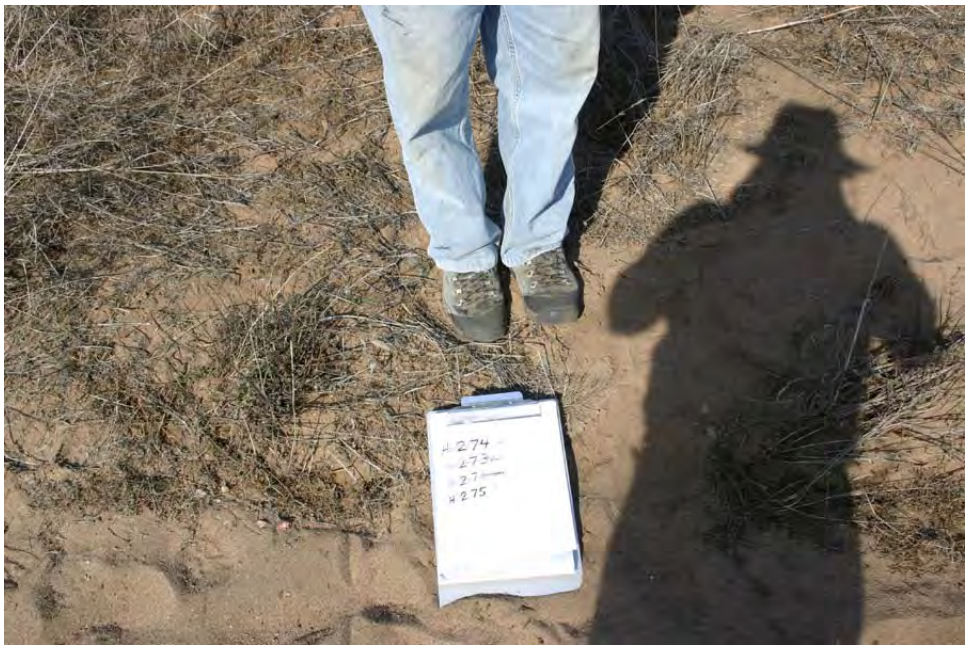
Plant (269) – Missing, 1.5-2” sand deposit.

Plant (270) – Missing, 1.5 – 2 inch sand deposit.

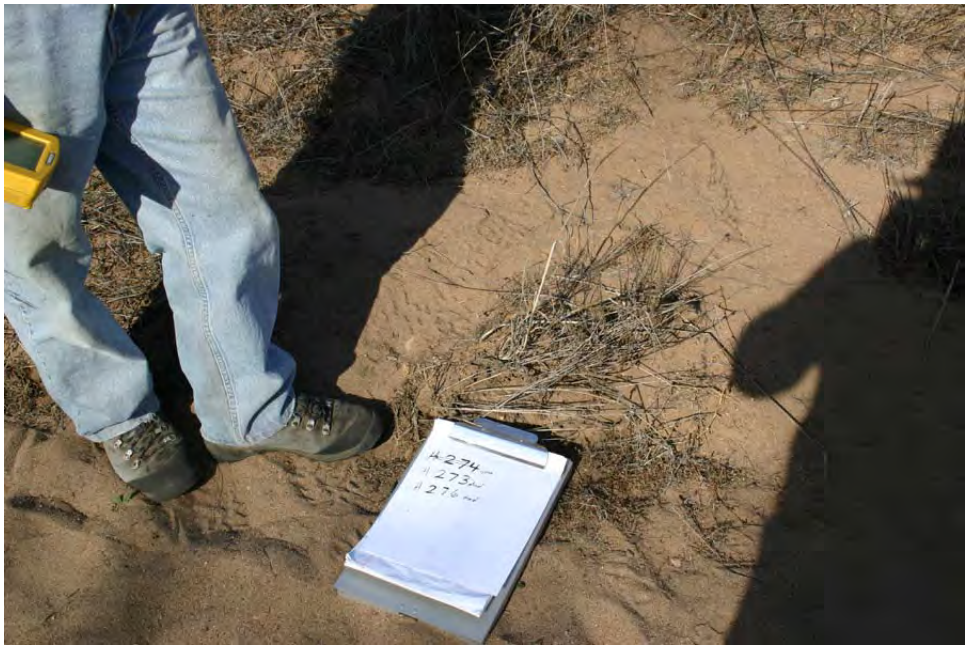
Plant (272) – Missing, 1.5 – 2” sand deposit.

Plant (273) – Dead.

Plant (274) – Missing, scour.



Plant (275) – Missing, 1.5 – 2” sand deposit.



Plant (276) – Dead. Sand deposit.

Plant (282) – Missing, 1.5 – 2" sand deposit.

Relocated plant (284) (?).

Plant 129 & 131 – Relocated 2005.

Plant (259 & 260) – Missing, bank erosion.

Plant (264 & 263) – Missing, scour.

Plant (280 & 281) – Missing, 1.5-2” sand deposit.

Salvia apiana near plant (282) – showing, 1.5 – 2” sand deposit.