“HERMES”
Health and Ecological Risk Management and Evaluation System

An Integrated Environmental Decision Support Tool

Battelle

Developed by
Pacific Northwest National Laboratory
for the U. S. Department of Energy

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Background

- Need to evaluate ecological and monetary trade-offs on the Hanford Site between remediation, restoration, and land use options before action is taken
- Ecological risk assessments normally focus on contaminant effects on wildlife, ignore impacts of the remediation action itself
- Need to connect different decision dimensions using common units

Objectives

- Develop a GIS-based decision support tool that concisely describes the current environmental landscape and can be used to make decisions
- Develop a tool that provides ecological information in a format directly comparable to other decision dimensions—including project costs and human health and wildlife risks

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Environmental Decision Making Made Easier

- HERMES—a flexible visualization and analysis program—helps environmental restoration, land use, and resource managers make decisions
- HERMES allows interactive evaluation of impacts with user-selected restoration costs and species values
- Other decision dimensions, such as human health, eco-risk, and ecosystem function can be included as extensions to the model

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Advantages

- Usable - links with user's existing databases
- Portable - can run on a laptop computer, which facilitates public involvement
- Easily manipulated - user can control data input values
- Expandable - modular design allows inclusion of additional decision dimensions

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The Basic Tool

- Allows user to select area(s) of interest
- Determines habitat types within selected area
- Calculates area (ha) of each habitat type
- Estimates cost of mitigation (if required)
- Estimates population sizes for a group of indicator species
- Calculates a “species value” for selected area

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The Basic Tool- cont'd

Allows user to

- control all cost and value estimations via user-defined look-up tables
- compare alternatives
- conduct "what-if" analyses if data are imperfect
- identify and rank sites based on ecological criteria
- add extensions that enable other types of analyses and decision support

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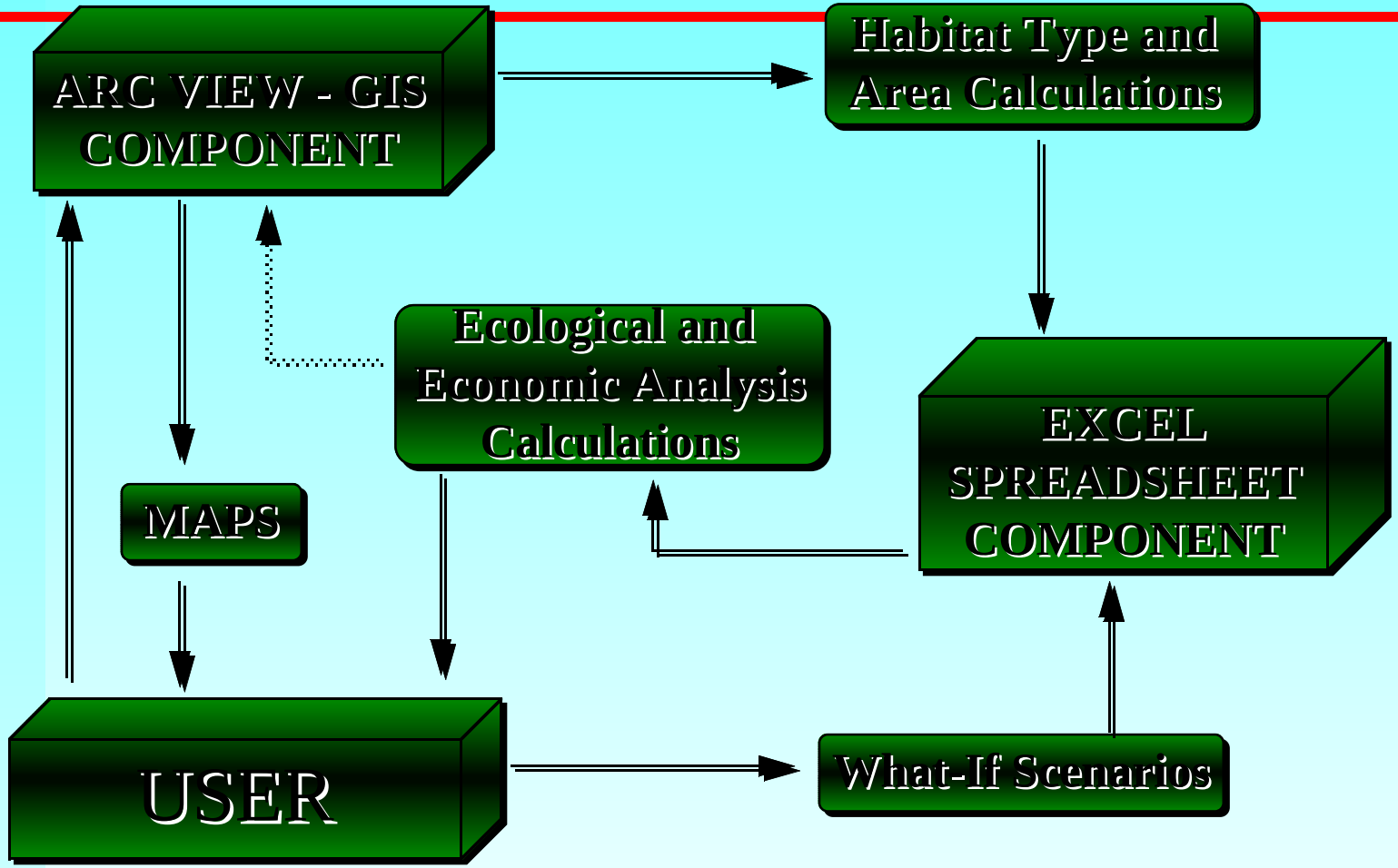
Tool Structure



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Let's Walk Through the HERMES Support Tool

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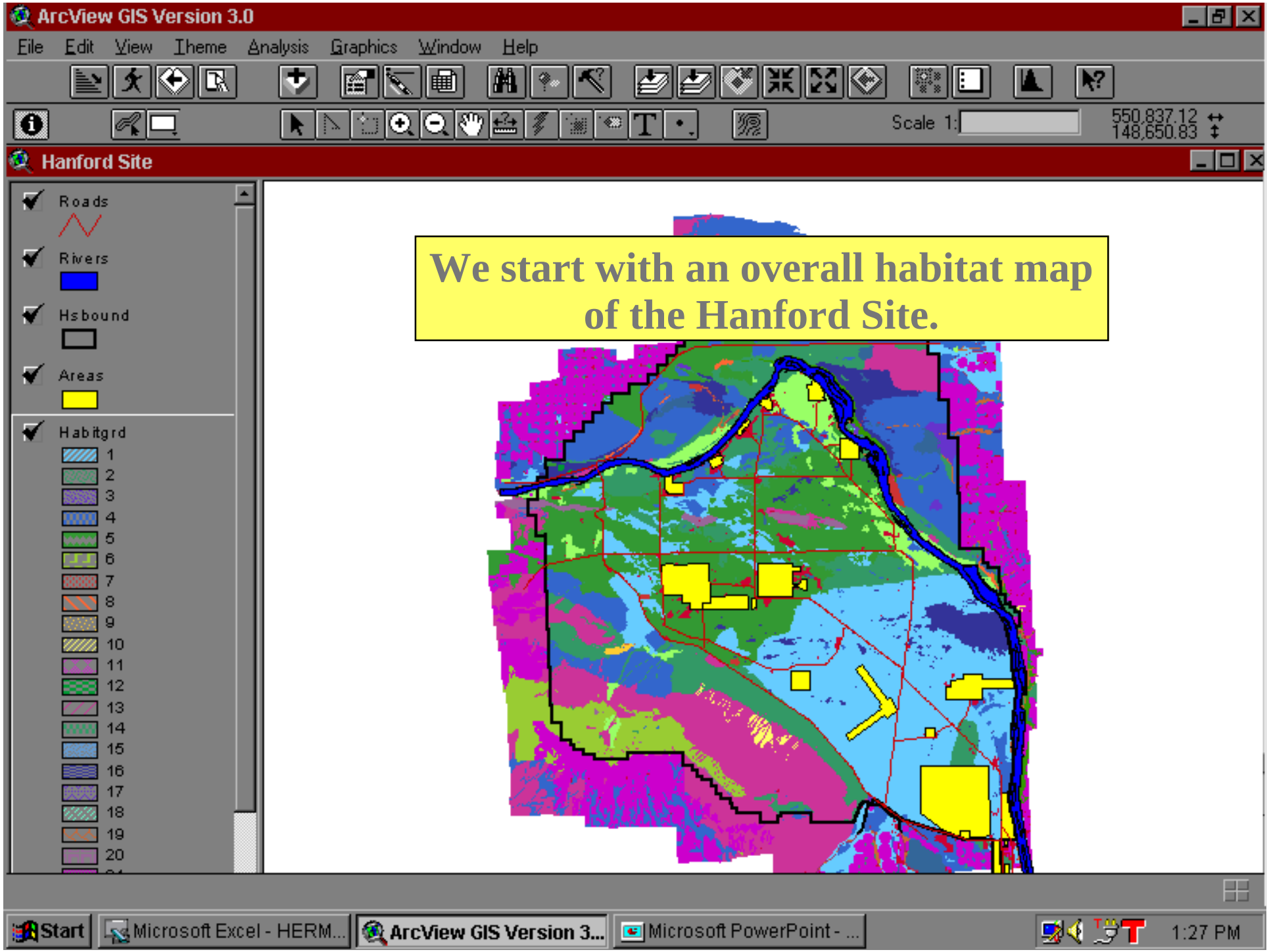
ArcView GIS Version 3.0
File Edit View Theme Analysis Graphics Window Help
Scale 1:
550,837.12
148,650.83
Hanford Site
Roads
Rivers
Hsbound
Areas
Habitgrd
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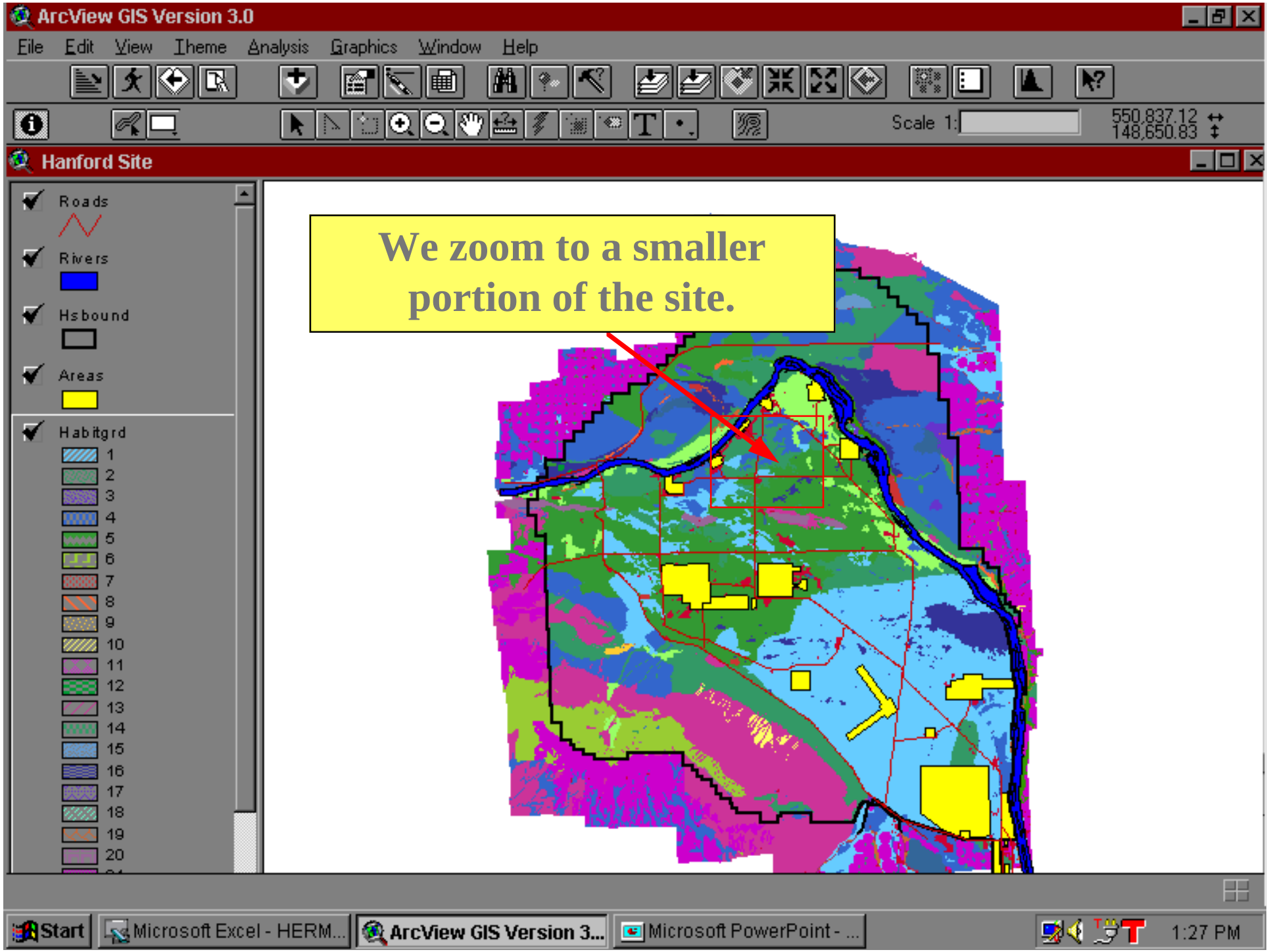
We start with an overall habitat map of the Hanford Site.
Start
Microsoft Excel - HERM...
ArcView GIS Version 3...
Microsoft PowerPoint - ...
1:27 PM


ArcView GIS Version 3.0
File Edit View Theme Analysis Graphics Window Help
Scale 1:
550,837.12
148,650.83
Hanford Site
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Hsbound
Areas
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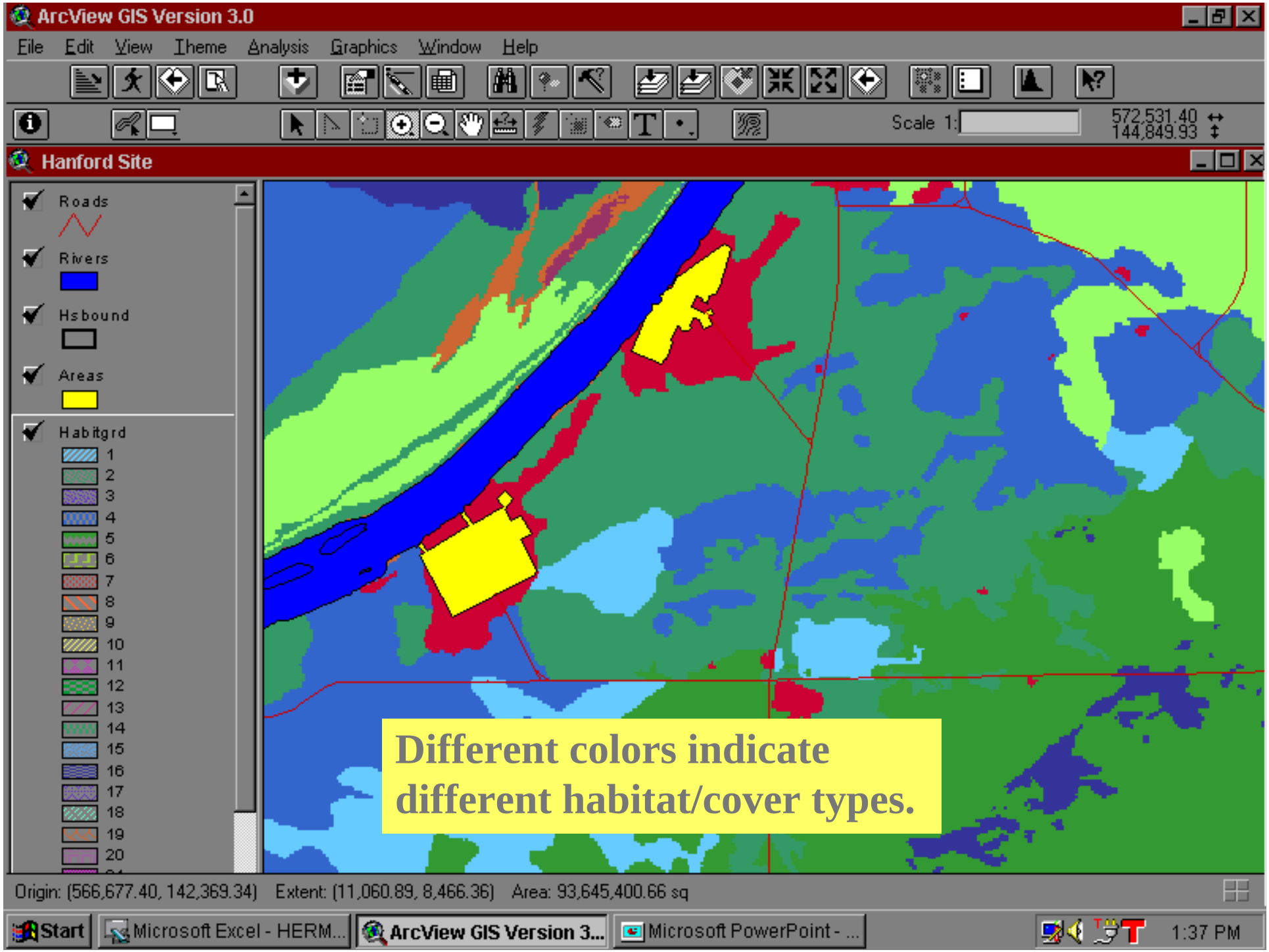
We zoom to a smaller portion of the site.
Start
Microsoft Excel - HERM...
ArcView GIS Version 3...
Microsoft PowerPoint - ...
1:27 PM



Different colors indicate different habitat/cover types.

Select Area to Examine

- User-provided tool allows one or more area(s) of interest to be selected
- Areas can be any shape or size
- HERMES calculates the area (ha) of each location selected
- If proposed disturbance is an excavation, user can enter depth, and HERMES calculates volume of material

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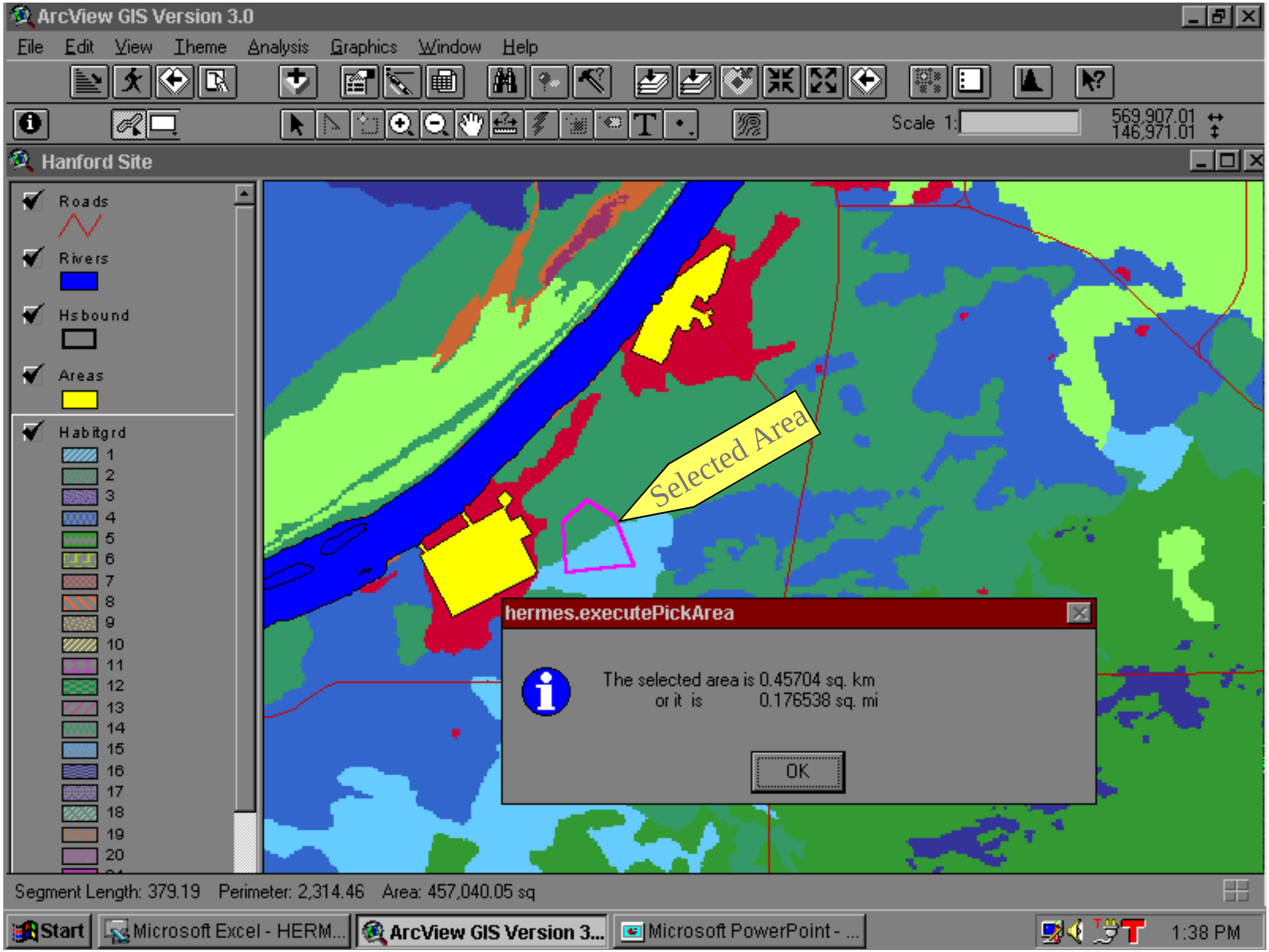
ArcView GIS Version 3.0
File Edit View Theme Analysis Graphics Window Help
Scale 1:
569,907.01
146,971.01
Hanford Site
Roads
Rivers
Hsbound
Areas
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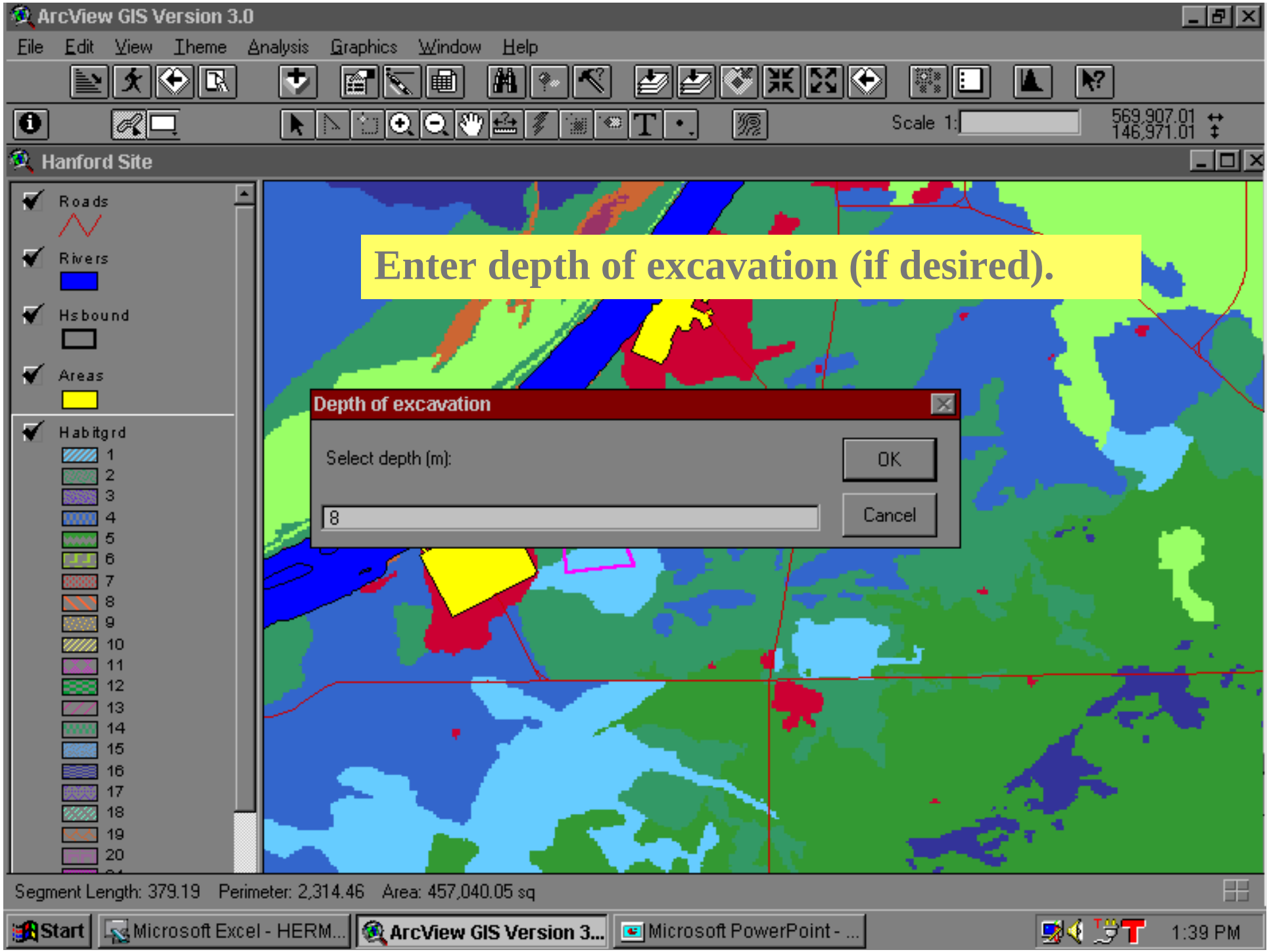
Selected Area
hermes.executePickArea
The selected area is 0.45704 sq. km
or it is 0.176538 sq. mi
OK
Segment Length: 379.19 Perimeter: 2,314.46 Area: 457,040.05 sq
Start
Microsoft Excel - HERM...
ArcView GIS Version 3...
Microsoft PowerPoint - ...
1:38 PM


ArcView GIS Version 3.0
File Edit View Theme Analysis Graphics Window Help
Scale 1:
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146,971.01
Hanford Site
Roads
Rivers
Hsbound
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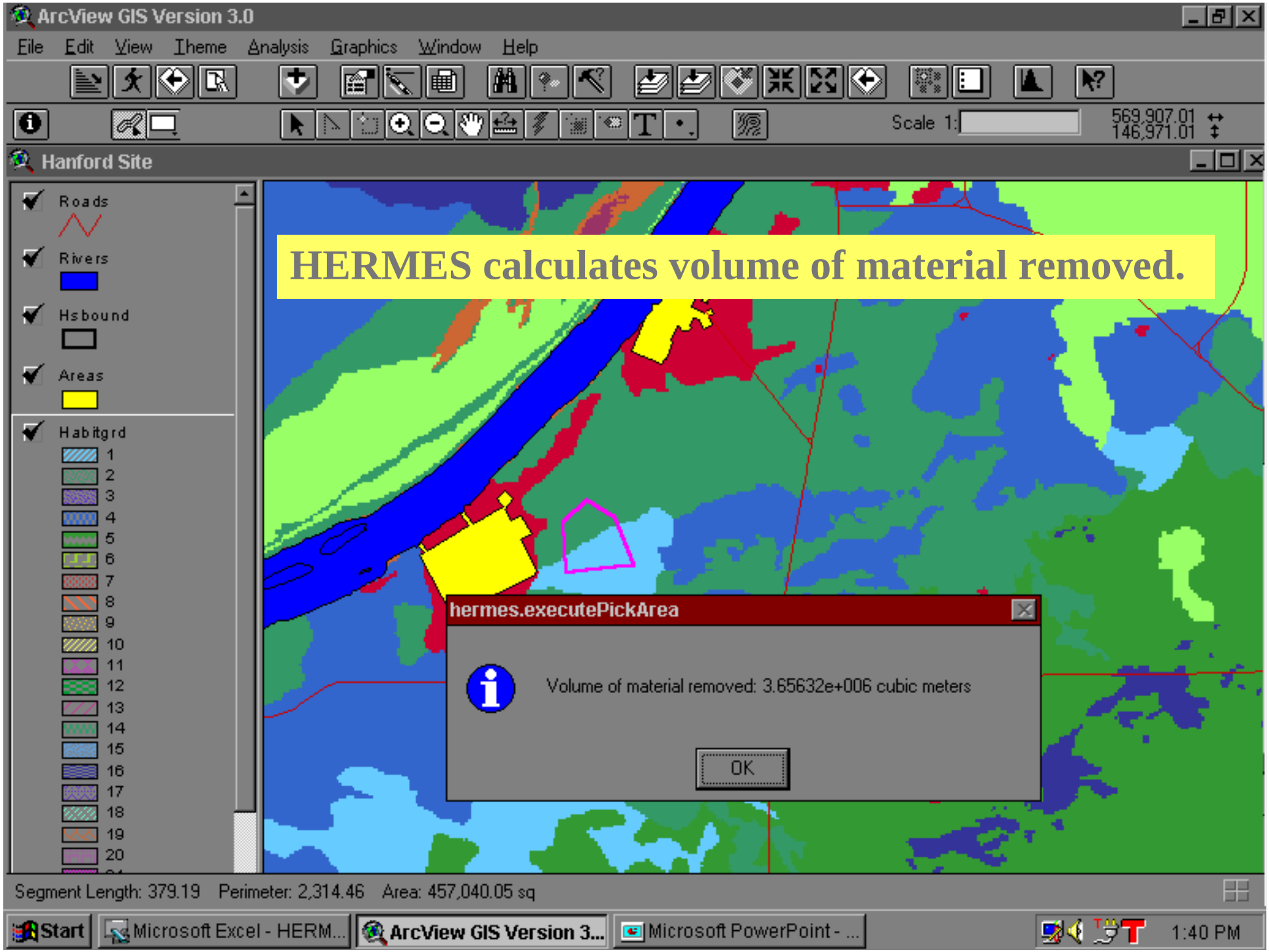
Enter depth of excavation (if desired).
Depth of excavation
Select depth (m):
8
OK
Cancel
Segment Length: 379.19 Perimeter: 2,314.46 Area: 457,040.05 sq
Start
Microsoft Excel - HERM...
ArcView GIS Version 3...
Microsoft PowerPoint - ...
1:39 PM


ArcView GIS Version 3.0
File Edit View Theme Analysis Graphics Window Help
Scale 1:
569,907.01
146,971.01
Hanford Site
Roads
Rivers
Hsbound
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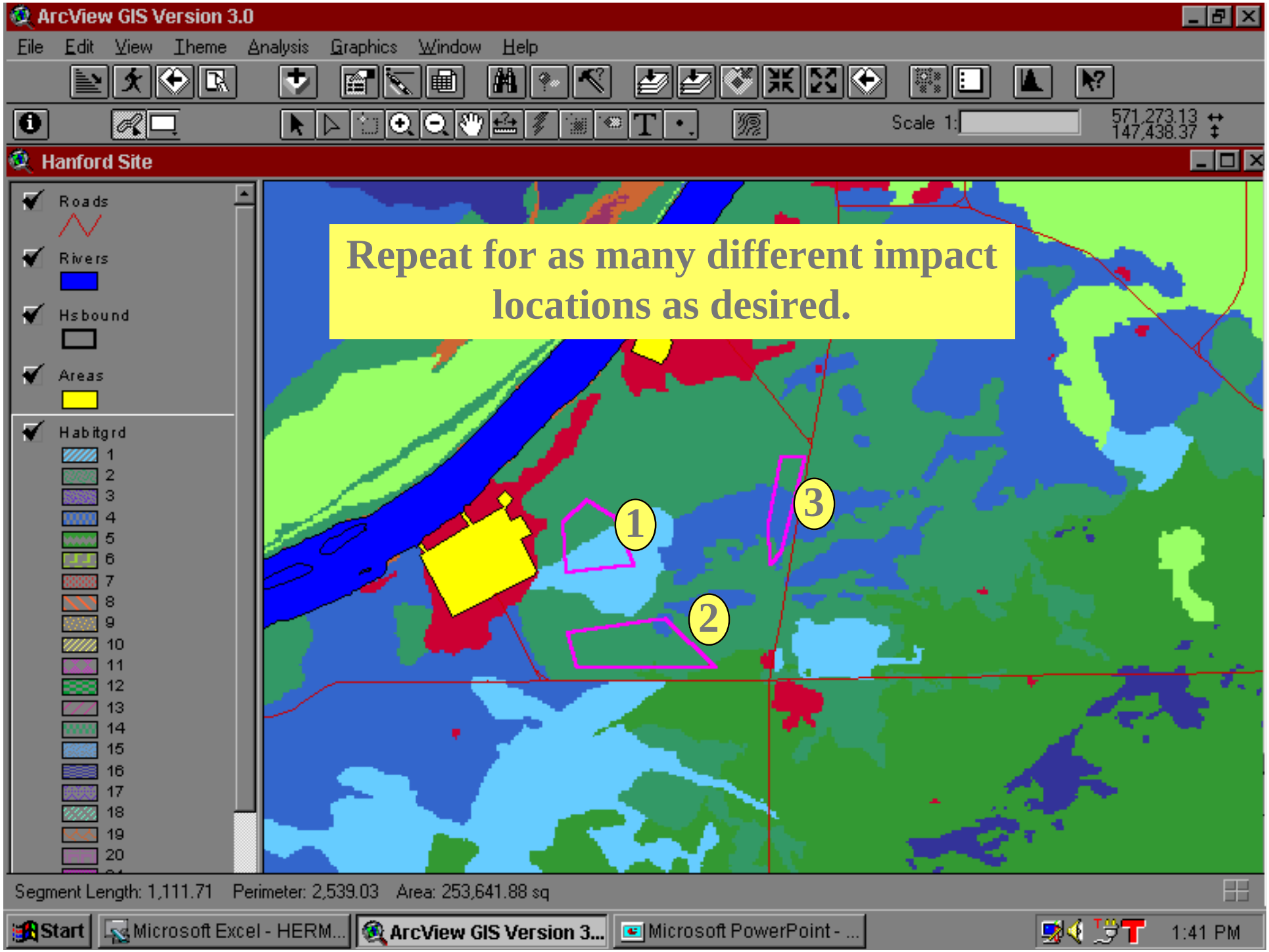
HERMES calculates volume of material removed.
hermes.executePickArea
Volume of material removed: 3.65632e+006 cubic meters
OK
Segment Length: 379.19 Perimeter: 2,314.46 Area: 457,040.05 sq
Start
Microsoft Excel - HERM...
ArcView GIS Version 3...
Microsoft PowerPoint - ...
1:40 PM


ArcView GIS Version 3.0
File Edit View Theme Analysis Graphics Window Help
Scale 1:
571,273.13
147,438.37
Hanford Site
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Rivers
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Repeat for as many different impact locations as desired.
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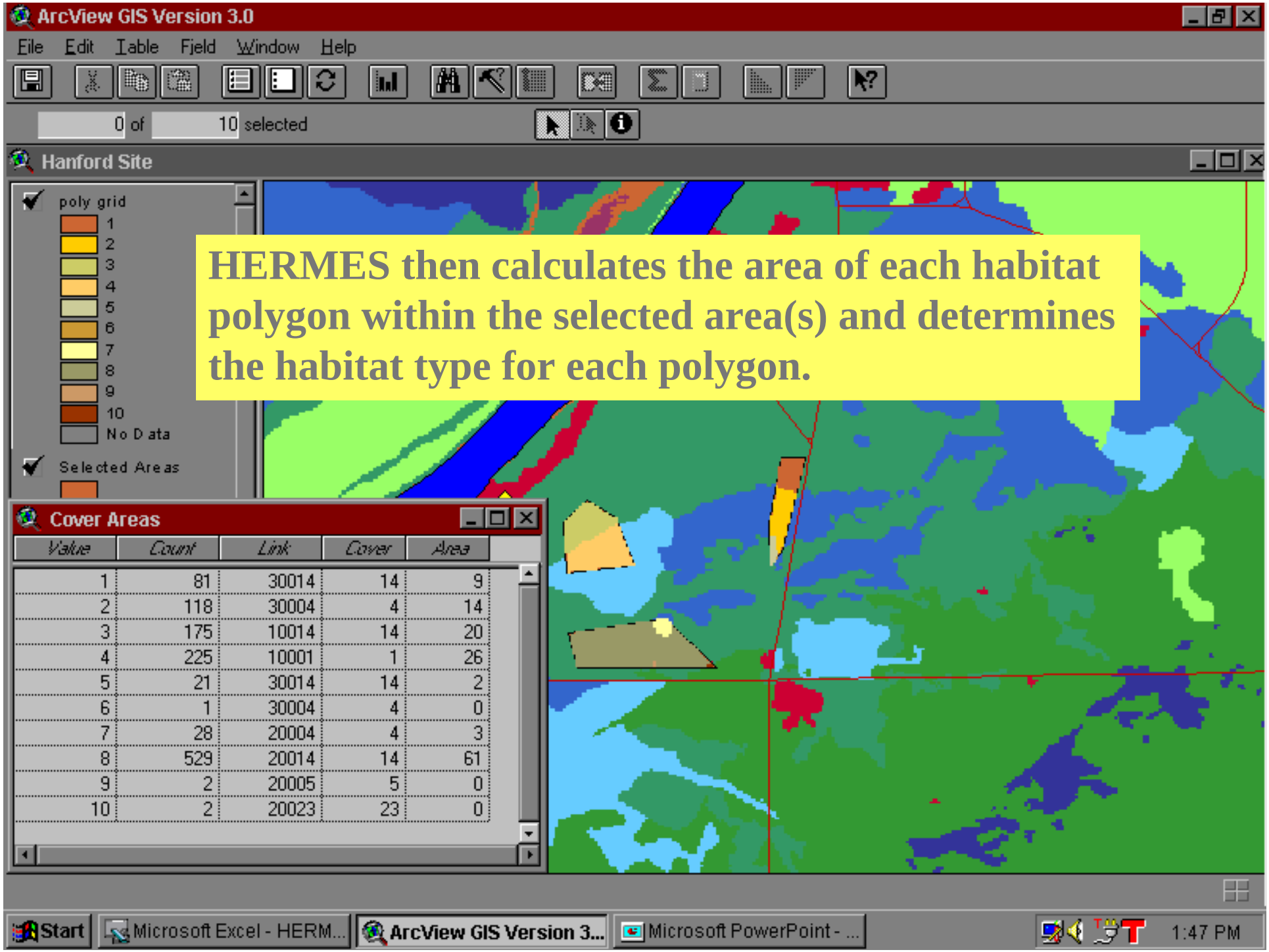
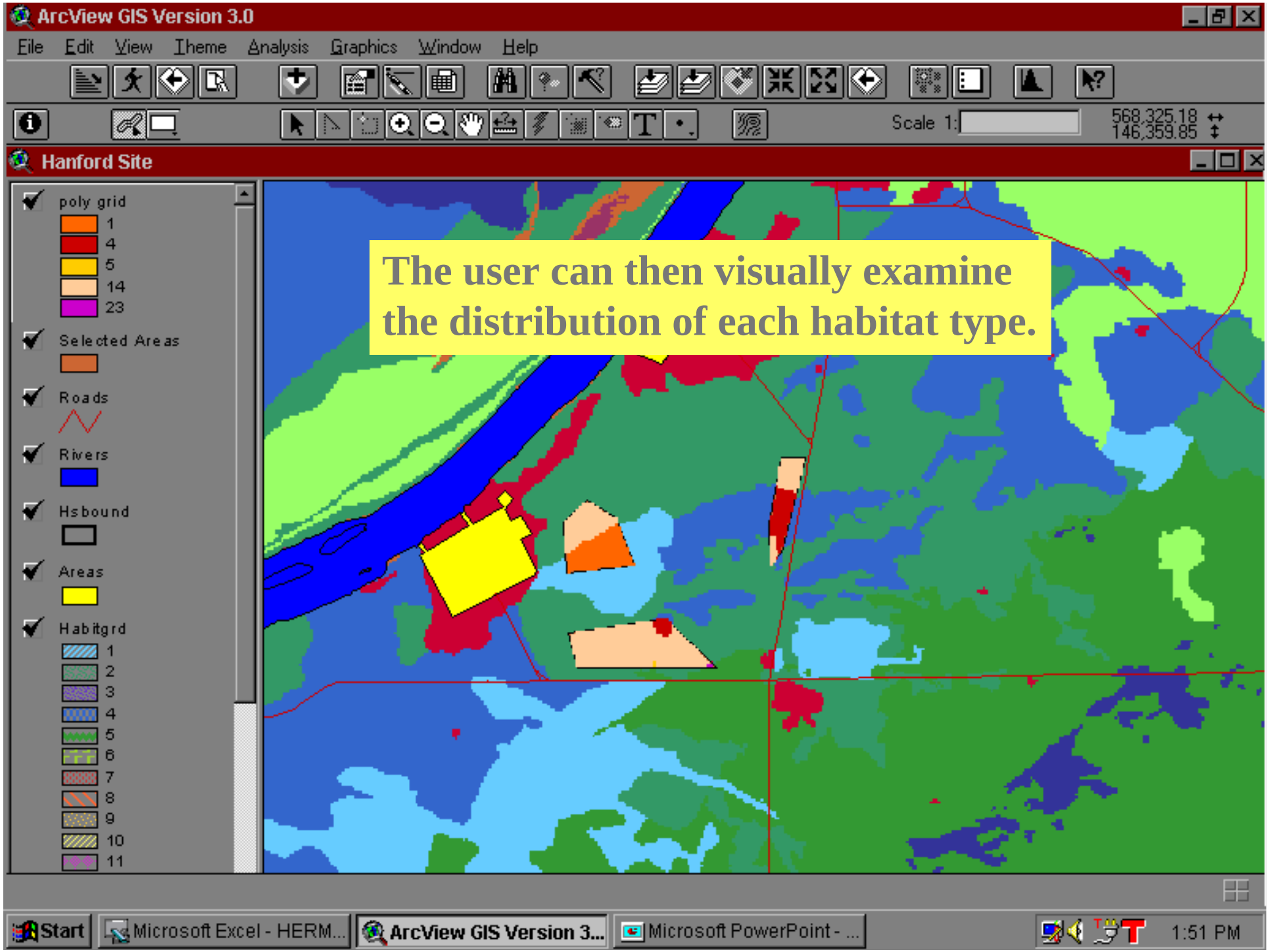
Segment Length: 1,111.71 Perimeter: 2,539.03 Area: 253,641.88 sq
Start
Microsoft Excel - HERM...
ArcView GIS Version 3...
Microsoft PowerPoint - ...
1:41 PM



Value	Count	Link	Cover	Area
1	81	30014	14	9
2	118	30004	4	14
3	175	10014	14	20
4	225	10001	1	26
5	21	30014	14	2
6	1	30004	4	0
7	28	20004	4	3
8	529	20014	14	61
9	2	20005	5	0
10	2	20023	23	0

HERMES then calculates the area of each habitat polygon within the selected area(s) and determines the habitat type for each polygon.



The user can then visually examine the distribution of each habitat type.

Microsoft Excel - HERMES.MOD

File Edit View Insert Format Tools Data Window Help

Cover Class	Area	Description	Mit Cost	Species Value	Other Value	Total Value

Data are fed to the spreadsheet portion of the model for detailed analysis of habitat replacement costs and ecological values.

Cover Classes / Polygons / C(CovClass) / Pop(CovClass) / C(yi) / P(yi) / Mitigation / U(yi) / Home Range / HSI / SpVal

Creates a button to which you can assign a macro

Start | Microsoft Excel - HER... | ArcView GIS Version 3.0 | Microsoft PowerPoint - ... | 1:53 PM

Microsoft Excel - HERMES.MOD

HERMES calculates total values and values for each habitat type.

Cover Class	Area	Description	Mit Cost	Species Value	Other Value	Total Value
1	26	Post-fire shrub-steppe on the Columbia River Plain	$78,000	7188		$85,188
4	17	Big Sagebrush/ Bunchgrasses-Cheatgrass	$153,000	10176		$163,176
5	0	Big Sagebrush-Spiny Hopsage/ Bunchgrasses-Cheatgrass	$0	0		$0
14	92	Cheatgrass-Sandberg's Bluegrass	$0	2368		$2,368
23	0	Buildings/ Parking Lots/ Gravel Pits/ Disturbed Areas	$0	0		$0
		Total Cost	$231,000	$19,732	$0	$250,732

Habitat Replacement Cost

Ecological Value

Microsoft Excel - HERMES.MOD

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Geneva 10

D15 Total Area

Alternatively, individual habitat polygons can be examined.

	A	B	C	D	E	F	G	H
1	Polygon_Num	Cover Class	Area	Description	Mit Cost	Species Value	Other Value	Total Value
2	4	1	26	Post-fire shrub-steppe on the Columbia River Plain	$78,000	7188		$85,188
3	2	4	14	Big Sagebrush/ Bunchgrasses-Cheatgrass	$126,000	8392		$134,392
4	6	4	0	Big Sagebrush/ Bunchgrasses-Cheatgrass	$0	0		$0
5	7	4	3	Big Sagebrush/ Bunchgrasses-Cheatgrass	$27,000	1784		$28,784
6	9	5	0	Big Sagebrush-Spiny Hopsage/ Bunchgrasses-Cheatgrass	$0	0		$0
7	1	14	9	Cheatgrass-Sandberg's Bluegrass	$0	36		$36
8	3	14	20	Cheatgrass-Sandberg's Bluegrass	$0	80		$80
9	5	14	2	Cheatgrass-Sandberg's Bluegrass	$0	8		$8
10	8	14	61	Cheatgrass-Sandberg's Bluegrass	$0	2244		$2,244
11	10	23	0	Buildings/ Parking Lots/ Gravel Pits/ Disturbed Areas	$0	0		$0
12								
13				Total Cost	$231,000	$19,732	$0	$250,732
14								
15				Total Area	135			
16								

Cover Classes | Polygons | C(CovClass) | Pop(CovClass) | C(yi) | P(yi) | Mitigation | U(yi) | Home Range | HSI | SpVal

Ready NUM

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Mitigation / Habitat Replacement

- Based on user-defined values table
- User determines if habitat type is mitigable
- User defines mitigation thresholds (minimum area that would require compensation)
- Costs of different revegetation components are defined
- Can be altered for “what-if” analyses

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Microsoft Excel - HERMES.MOD

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Geneva 10

I6 4000

	A	B	C	D	E	F	G	H	I	J	K	L
1	Cover Class	Description	Mitigable	Threshold	MCPH	#tublings/ha	$/tubling	Native Grass or Herb Planting ($/ha)	Other Material Cost ($/ha)	Other costs explantation		
2	1	Post-fire shrub-steppe on the Columbia River Plain	Y	2	3000	500	4	1000	0			
3	2	Rabbitbrush/Bunchgrasses	N	0	0	0	0	0	0			
4	3	Rabbitbrush/Cheatgrass	N	0	0	0	0	0	0			
5	4	Big Sagebrush/ Bunchgrasses-Cheatgrass	Y	0.5	9000	1000	4	1000	4000	Mature shrub transplant (10/ha @ 400$/each)		
6	5	Big Sagebrush-Spiny Hopsage/ Bunchgrasses-Cheatgrass	Y	0.5	9000	1000	4	1000	4000	Mature shrub transplant (10/ha @ 400$/each)		
7	6	Threetip Sagebrush/ Bunchgrasses	Y	0.5	5000	1000	4	1000	0			
8	7	Spiny Hopsage/ Bunchgrasses	Y	5	9000	1000	4	1000	4000	Mature shrub transplant (10/ha @ 400$/each)		
9	8	Spiny Hopsage/Cheatgrass	N	0	0	0	0	0	0			
10	9	Black Greasewood/ Sandberg's Bluegrass	Y	0.5	4000	750	4	1000	0			
11	10	Winterfat/Bunchgrasses	Y	0.5	4000	1000	4					
12	11	Winterfat/Cheatgrass	N	0	0	0	0	0	0			
13	12	Snow Buckwheat/Indian Ricegrass	Y	2	1200	0	0	1000	200	Snow buckwheat seed		
14	13	Bunchgrasses	Y	3	1000	0	0	1000	0			
15	14	Cheatgrass-Sandberg's Bluegrass	N	0	0	0	0	0	0			
16	15	Planted Non-Native Grass	N	0	0	0	0	0	0			
	16	Bitterbrush/Bunchgrasses	Y	0.5	9000	1000	4	1000	4000	Mature shrub transplant (10/ha @		

Cover Classes / Polygons / C(CovClass) / Pop(CovClass) / C(yi) / P(yi) / Mitigation / U(yi) / Home Range / HSI / SpVal

Ready NUM

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Microsoft Excel - HERMES.MOD

File Edit View Insert Format Tools Data Window Help

Geneva

G10

Different cost estimates for tublings and shrubs…..

Cover Class	Description	Mitigable	Threshold	MCPH	#tublings/ha	$/tubling	Native Grass or Herb Planting ($/ha)	Other Material Cost ($/ha)	Other costs explantation
1	Post-fire shrub-steppe on the Columbia River Plain	Y	2	3000	500	4	1000	0	
2	Rabbitbrush/Bunchgrasses	N	0	0	0	0	0	0	
3	Rabbitbrush/Cheatgrass	N	0	0	0	0	0	0	
4	Big Sagebrush/ Bunchgrasses-Cheatgrass	Y	0.5	4000	1000	2	1000	1000	Mature shrub transplant (10/ha @ 100$/each)
5	Big Sagebrush-Spiny Hopsage/ Bunchgrasses-Cheatgrass	Y	0.5	9000	1000	4	1000	4000	Mature shrub transplant (10/ha @ 400$/each)
6	Threetip Sagebrush/ Bunchgrasses	Y	0.5	5000	1000	4	1000	0	
7	Spiny Hopsage/ Bunchgrasses	Y	5	9000	1000	4	1000	4000	Mature shrub transplant (10/ha @ 400$/each)
8	Spiny Hopsage/Cheatgrass	N	0	0	0	0	0	0	
9	Black Greasewood/ Sandberg's Bluegrass	Y	0.5	4000	750	4	1000	0	
10	Winterfat/Bunchgrasses	Y	0.5	4000	1000	4			
11	Winterfat/Cheatgrass	N	0	0	0	0	0	0	
12	Snow Buckwheat/Indian Ricegrass	Y	2	1200	0	0	1000	200	Snow buckwheat seed
13	Bunchgrasses	Y	3	1000	0	0	1000	0	
14	Cheatgrass-Sandberg's Bluegrass	N	0	0	0	0	0	0	
15	Planted Non-Native Grass	N	0	0	0	0	0	0	
16	Bitterbrush/Bunchgrasses	Y	0.5	9000	1000	4	1000	4000	Mature shrub transplant (10/ha @

Cover Classes / Polygons / C(CovClass) / Pop(CovClass) / C(yi) / P(yi) / Mitigation / U(yi) / Home Range / HSI / SpVal

Ready NUM

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Microsoft Excel - HERMES.MOD

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D14

	A	B	C	D	E	F	G	H
1	Cover Class	Area	Description	Mit Cost	Species Value	Other Value	Total Value	
2	1	26	Post-fire shrub-steppe on the Columbia River Plain	$78,000	7188		$85,188	
3	4	17	Big Sagebrush/ Bunchgrasses-Cheatgrass	$68,000	10176		$78,176	
4	5	0	Big Sagebrush-Spiny Hopsage/ Bunchgrasses-Cheatgrass	$0	0		$0	
5	14	92	Cheatgrass-Sandberg's Bluegrass	$0	2368		$2,368	
6	23	0	Buildings/ Parking Lots/ Gravel Pits/ Disturbed Areas	$0	0		$0	
7								
8			Total Cost	$146,000	$19,732	$0	$165,732	

…. change the overall cost estimates.

Cover Classes / Polygons / C(CovClass) / Pop(CovClass) / C(yi) / P(yi) / Mitigation / U(yi) / Home Range / HSI / SpVal

Ready NUM

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Cover Class	Area	Description	Total Species Value	Burrowing Owl	Coyote	Loggerhead Shrike	Northern Harrier	Pocket mouse	Sage Sparrow	Sagebrush Lizard
1	26	Post-fire shrub-steppe on the Columbia River Plain	$7,188	$0	$0	$1,000	$0	$208	$780	$5,200
4	17	Big Sagebrush/ Bunchgrasses Cheatgrass	$10,176	$0	$0	$1,200	$0	$136	$2,040	$6,800
5	0	Big Sagebrush-Spiny Hopsage/ Bunchgrasses-Cheatgrass	$0	$0	$0	$0	$0	$0	$0	$0
14	92	Cheatgrass-Sandberg's Bluegrass	$2,368	$2,000	$0	$0	$0	$368	$0	$0
23	0	Buildings/ Parking Lots/ Gravel Pits/ Disturbed Areas	$0	$0	$0	$0	$0	$0	$0	$0
		Total	$19,732	$2,000	$0	$2,200	$0	$712	$2,820	$12,000

The "species value" is estimated for each habitat type and species combination by multiplying an estimated "unit value" by the estimated population size for each species.

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Species (y)	Unit Value (Vy)
Burrowing Owl	2000
Coyote	500
Loggerhead Shrike	200
Northern Harrier	1000
Pocket mouse	0.5
Sage Sparrow	30
Sagebrush Lizard	2

The unit value is currently the user's best guess, but could easily be the result of more complex economic models or valuation techniques, if available for the species of interest.

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Geneva 10

D8 =SUM(D2:D6)

	A	B	C	D	E	F	G	H	I	J	K
1	Cover Class	Area	Description	Burrowing Owl	Coyote	Loggerhead Shrike	Northern Harrier	Pocket mouse	Sage Sparrow	Sagebrush Lizard	
2	1	26	Post-fire shrub-steppe on the Columbia River Plain	0.78	0.052	5.2	0.173333333	416	26	2600	
3	4	17	Big Sagebrush/ Bunchgrasses-Cheatgrass	0.68	0.034	6.8	0.113333333	272	68	3400	
4	5	0	Big Sagebrush-Spiny Hopsage/ Bunchgrasses-Cheatgrass	0	0	0	0	0	0	0	
5	14	92	Cheatgrass-Sandberg's Bluegrass	1.84	0.184	0	0.148686869	736	0	0	
6	23	0	Buildings/ Parking Lots/ Gravel Pits/ Disturbed Areas	0	0	0	0	0	0	0	
7											
8			Total	3.30	0.27	12.00	0.44	1424.00	94.00	6000.00	

Similarly, population size could be the result of species-specific population models, but currently is a simple calculation that incorporates…..

Cover Classes / Polygons / C(CovClass) / Pop(CovClass) / C(yi) / P(yi) / Mitigation / U(yi) / Home Range / HSI / SpVal

Ready NUM

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Microsoft Excel - HERMES.MOD

Species (y)	Home Range (ha)
Burrowing Owl	50
Coyote	1000
Loggerhead Shrike	5
Northern Harrier	300
Pocketmouse	0.1
Sage Sparrow	0.5
Sagebrush Lizard	0.01

.... the estimated home range size for each species in a ideal habitat, the area of each habitat type affected, and ....

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File Edit View Insert Format Tools Data Window Help

.... the estimated suitability of each habitat type for each species.

1	Cover Type	Description	Burrowing Owl	Coyote	Loggerhead Shrike	Northern Harrier	Pocketmouse	Sage Sparrow	Sagebrush Lizard
2	1	Post-fire shrub-steppe on the Columbie	0.75	1	0.5	1.00	0.8	0.25	0.5
3	2	Rabbitbrush/Bunchgrasses	0.5	1	0.25	0.61	0.4	0.25	0
4	3	Rabbitbrush/Cheatgrass	0.5	1	0.25	0.30	0.4	0	0
5	4	Big Sagebrush/Bunchgrasses-Cheatgr	1	1	1	1.00	0.8	1	1
6	5	Big Sagebrush-Spiny Hopsage/Bunche	1	1	1	1.00	0.8	1	1
7	6	Threetip Sagebrush/Bunchgrasses	0.5	1	0.25	0.61	0.4	0.25	0.5
8	7	Spiny Hopsage/Bunchgrasses	1	1	1	1.00	0.8	0.5	0.75
9	8	Spiny Hopsage/Cheatgrass	0.5	1	0.5	0.30	0.8	0.5	0.25
10	9	Black Greasewood/Sandberg's Bluegr	0.75	1	0.75	0.50	0.6	0.5	0
11	10	Winterfat/Bunchgrasses	0.75	1	0.25	0.61	0.6	0	0
12	11	Winterfat/Cheatgrass	0.5	1	0.25	0.61	0.4	0	0
13	12	Snow Buckwheat/Indian Ricegrass	1	1	0.25	0.61	0.8	0	0
14	13	Bunchgrasses	0.75	1	0.25	0.30	0.6	0	0
15	14	Cheatgrass-Sandberg's Bluegrass	0.5	1	0	0.24	0.4	0	0
16	15	Planted Non-Native Grass	0.25	1	0	0.24	0.4	0	0
17	16	Bitterbrush/Bunchgrasses Sand Dune	0.5	1	0.75	1.00	0.8	0.5	0.75
18	17	Bitterbrush/Cheatgrass	0.5	1	0.5	0.50	0.8	0.25	0.25
19	18	Alkali Saltgrass-Cheatgrass	0.25	1	0	0.50	0.4	0	0
20	19	Riparian	0.5	1	0	0.61	1	0	0
21	20	Basalt Outcrops	0.25	1	0	0.61	0.2	0	0
22	21	Agricultural Areas	0.5	1	0	0.50	0.4	0	0
23	22	Abandoned Old Fields	0.5	1	0	0.50	0.8	0	0
24	23	Buildings/Parking Lots/Gravel Pits/Distu	0	0	0	0.00	0	0	0
25	24	Riverine Wetlands and Associated Dee	0	0	0	0.00	0	0	0
26	25	Non-Riverine Wetlands and Associate	0	0	0	0.00	0	0	0
27	26	Cliffs (White Bluffs)	0	0	0	0.00	0	0	0

Polygons / C(CovClass) / Pop(CovClass) / C(yi) / P(yi) / Mitigation / U(yi) / Home Range / HSI / SpValue / Sheet1

Ready NUM

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Microsoft Excel - HERMES.MOD

File Edit View Insert Format Tools Data Window Help

85%

Geneva 10

B28

	A	B	C	D	E	F	G	H	I
1	Cover Type	Description	Burrowing Owl	Coyote	Loggerhead Shrike	Northern Harrier	Pocketmouse	Sage Sparrow	Sagebrush Lizard
2	1	Post-fire shrub-steppe on the Columbie	0.75	1	0.5	1.00	0.8	0.25	0.5
3	2	Rabbitbrush/Bunchgrasses	0.5	1	0.25	0.61	0.4	0.25	0
4	3	Rabbitbrush/Cheatgrass	0.5	1	0.25	0.30	0.4	0	0
5	4	Big Sagebrush/Bunchgrasses-Cheatgr	1	1	**0.33**	1.00	0.8	1	1
6	5	Big Sagebrush-Spiny Hopsage/Bunche	1	1	1	1.00	0.8	1	1
7	6	Threetip Sagebrush/Bunchgrasses	0.5	1	0.25	0.61	0.4	0.25	0.5
8	7	Spiny Hopsage/Bunchgrasses	1	1	1	1.00	0.8	0.5	0.75
9	8	Spiny Hopsage/Cheatgrass	0.5	1	0.5	0.30	0.8	0.5	0.25
10	9	Black Greasewood/Sandberg's Bluegr	0.75	1	0.75	0.50	0.6	0.5	0
11	10	Winterfat/Bunchgrasses	0.75	1	0.25	0.61	0.6	0	0
12	11	Winterfat/Cheatgrass	0.5	1	0.25	0.61	0.4	0	0
23	22	Abandoned Old Fields	0.5	1	0	0.50	0.8	0	0
24	23	Buildings/Parking Lots/Gravel Pits/Distu	0	0	0	0.00	0	0	0
25	24	Riverine Wetlands and Associated Dee	0	0	0	0.00	0	0	0
26	25	Non-Riverine Wetlands and Associate	0	0	0	0.00	0	0	0
27	26	Cliffs (White Bluffs)	0	0	0	0.00	0	0	0

Changes to any of these parameters will alter the overall value calculations. For instance, changing the suitability of big sagebrush/bunchgrass-cheatgrass habitat for loggerhead shrikes from 1 to 0.33….

Polygons / C(CovClass) / Pop(CovClass) / C(yi) / P(yi) / Mitigation / U(yi) / Home Range / HSI / SpValue / Sheet1

Ready NUM

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Microsoft Excel - HERMES.MOD

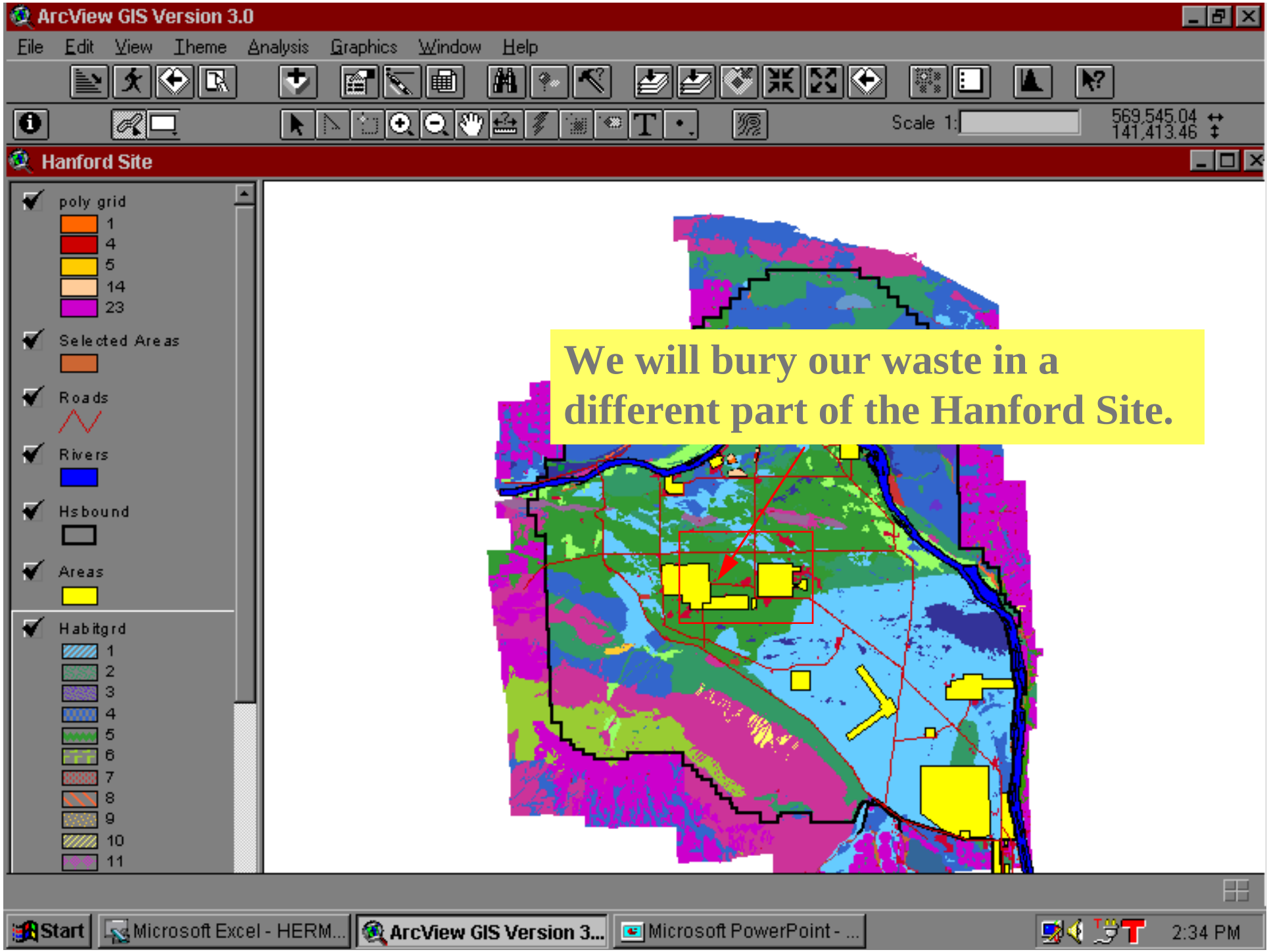
Cover Class	Area	Description	Mit Cost	Species Value	Other Value	Total Value
1	26	Post-fire shrub-steppe on the Columbia River Plain	$78,000	7188		$85,188
4	17	Big Sagebrush/ Bunchgrasses-Cheatgrass	$68,000	9376		$77,376
5	0	Big Sagebrush-Spiny Hopsage/ Bunchgrasses-Cheatgrass	$0	0		$0
14	92	Cheatgrass-Sandberg's Bluegrass	$0	2368		$2,368
23	0	Buildings/ Parking Lots/ Gravel Pits/ Disturbed Areas	$0	0		$0
		Total Cost	$146,000	$18,932	$0	$164,932

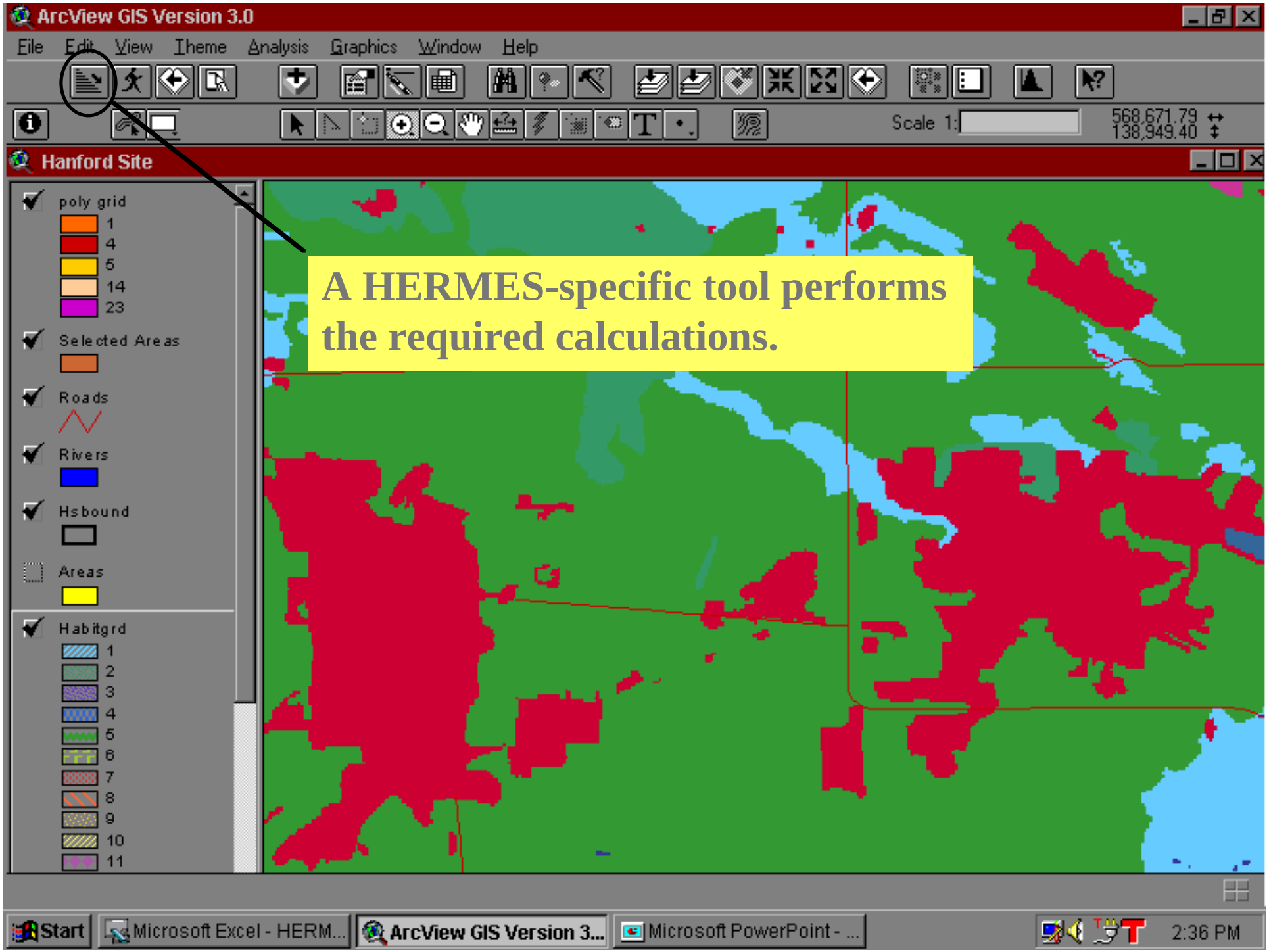
....would reduce the shrike population size, and therefore, reduce the overall species value estimate.

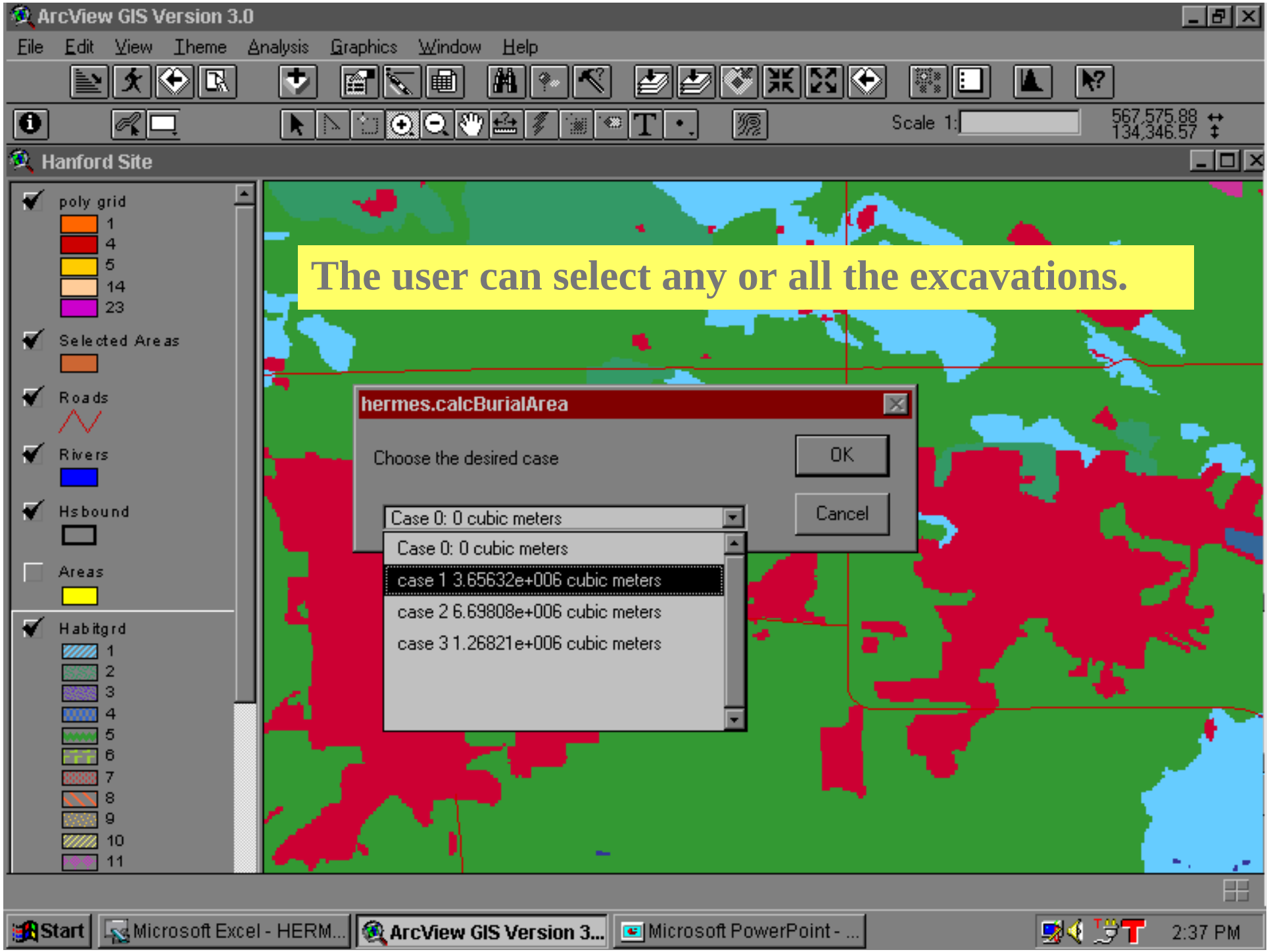
HERMES Extensions

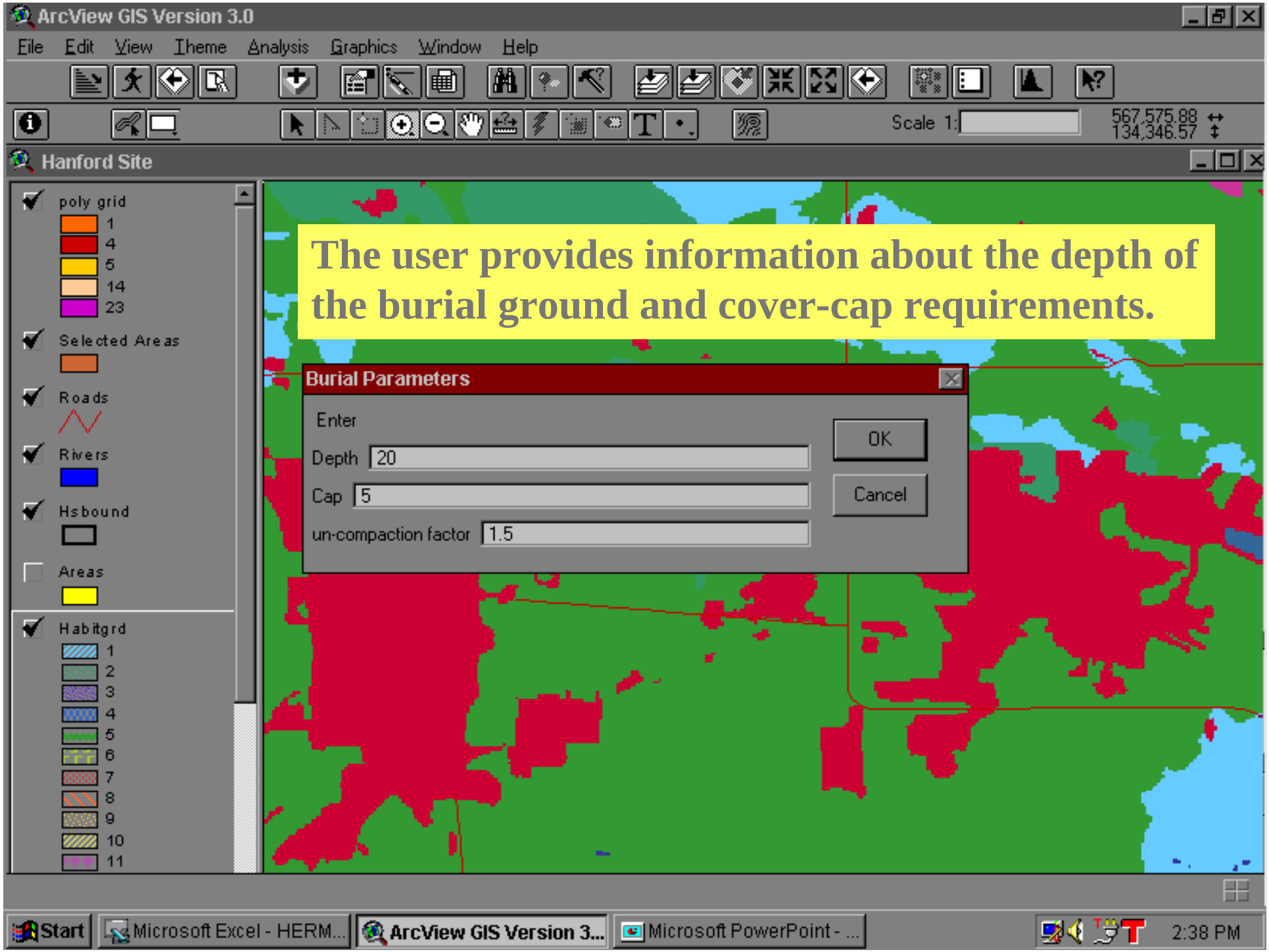
- One extension allows user to compare ecological impacts of alternative burial sites for waste site remediation projects
- HERMES estimates the area requirement for specified amounts of material and depth of proposed burial ground
- Side slopes and spoils storage areas taken into account

Battelle

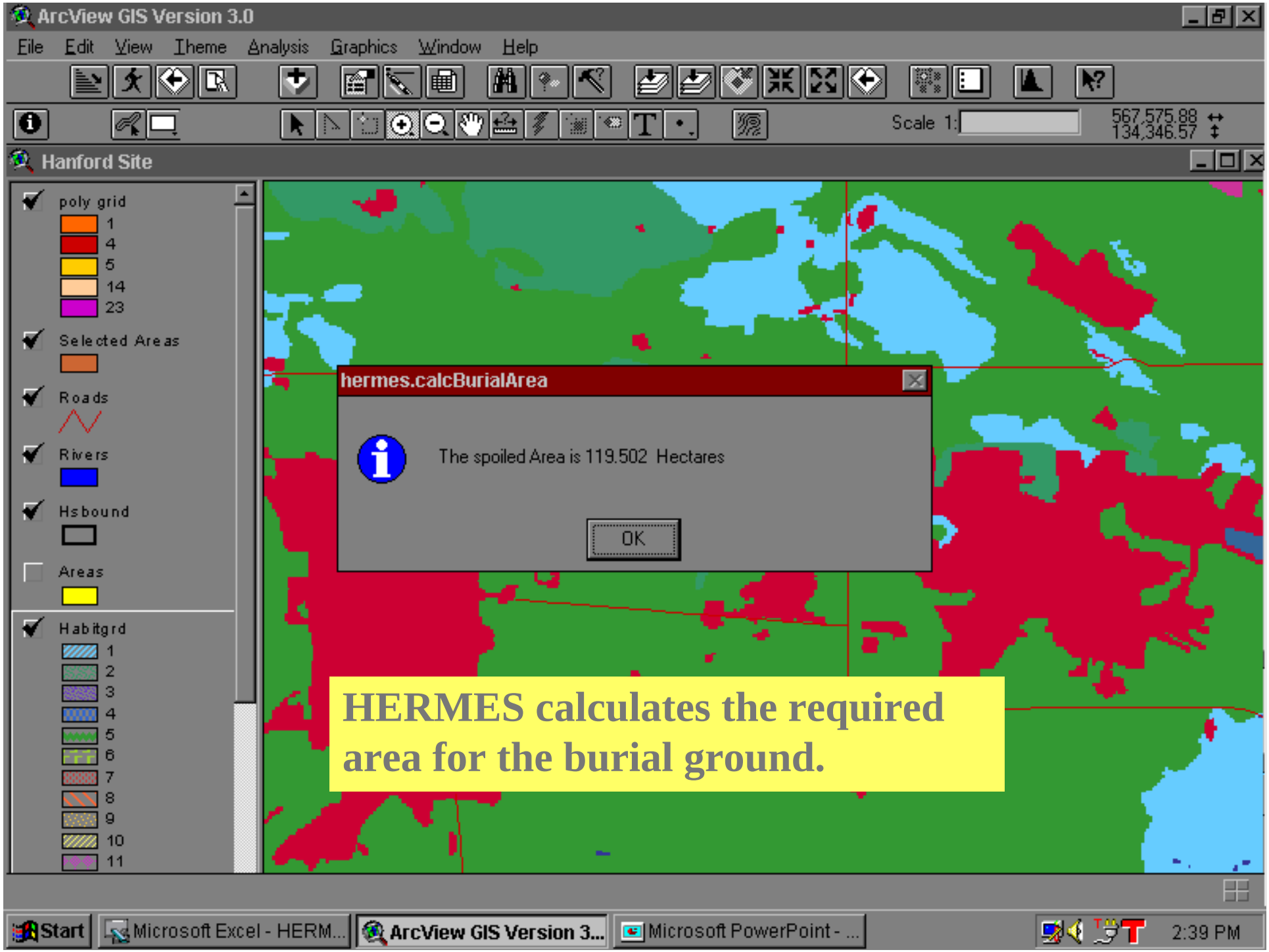

ArcView GIS Version 3.0
File Edit View Theme Analysis Graphics Window Help
Scale 1:
569,545.04
141,413.46
Hanford Site
poly grid
1
4
5
14
23
Selected Areas
Roads
Rivers
Hsbound
Areas
Habitgrd
1
2
3
4
5
6
7
8
9
10
11
We will bury our waste in a different part of the Hanford Site.
Start
Microsoft Excel - HERM...
ArcView GIS Version 3...
Microsoft PowerPoint - ...
2:34 PM


ArcView GIS Version 3.0
File Edit View Theme Analysis Graphics Window Help
Scale 1:
568,671.79
138,949.40
Hanford Site
poly grid
1
4
5
14
23
Selected Areas
Roads
Rivers
Hsbound
Areas
Habitgrd
1
2
3
4
5
6
7
8
9
10
11
A HERMES-specific tool performs the required calculations.
Start
Microsoft Excel - HERM...
ArcView GIS Version 3...
Microsoft PowerPoint - ...
2:36 PM

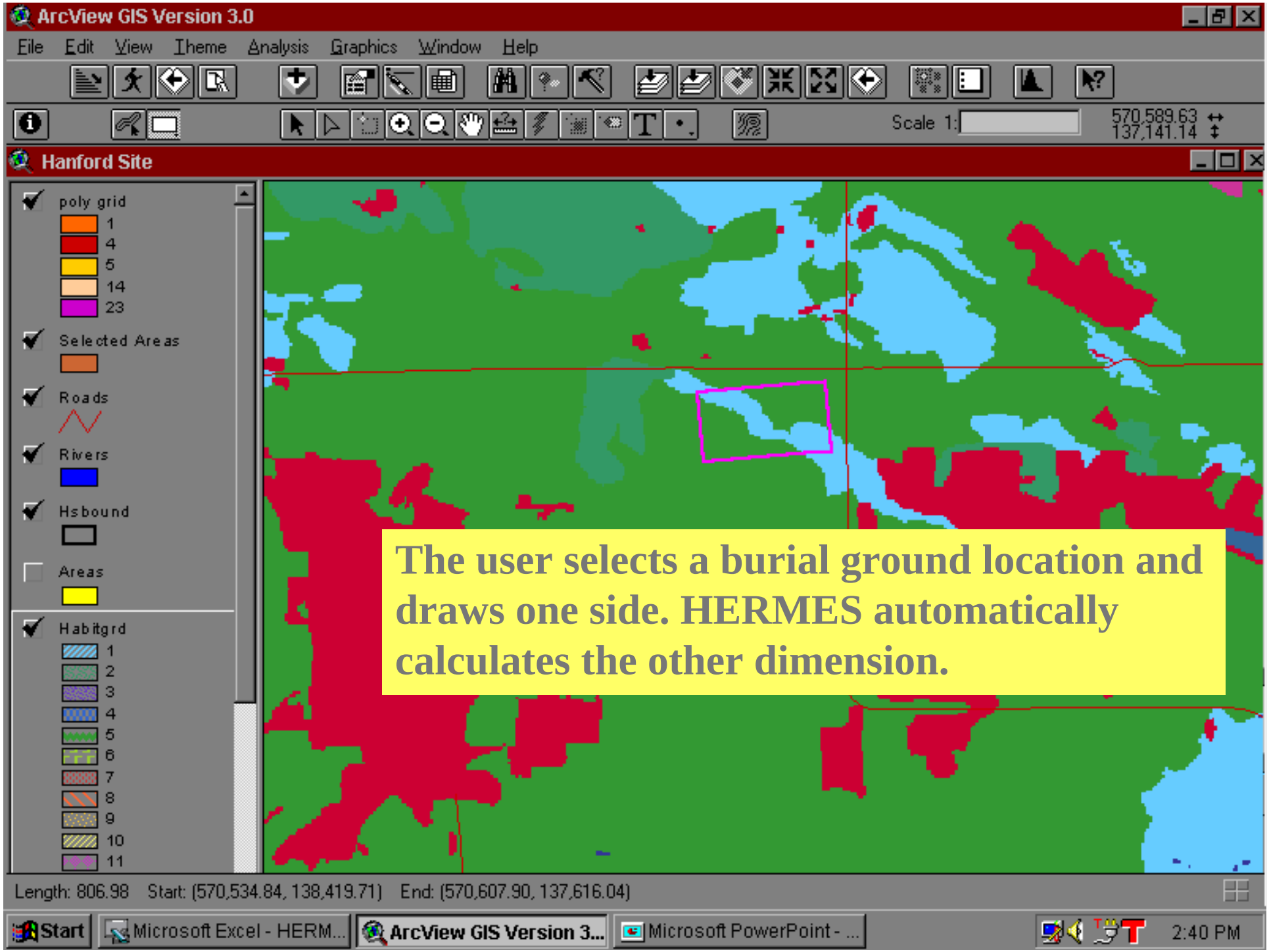

ArcView GIS Version 3.0
File Edit View Theme Analysis Graphics Window Help
Scale 1:
567,575.88
134,346.57
Hanford Site
poly grid
1
4
5
14
23
Selected Areas
Roads
Rivers
Hsbound
Areas
Habitgrd
1
2
3
4
5
6
7
8
9
10
11
The user can select any or all the excavations.
hermes.calcBurialArea
Choose the desired case
OK
Cancel
Case 0: 0 cubic meters
Case 0: 0 cubic meters
case 1 3.65632e+006 cubic meters
case 2 6.69808e+006 cubic meters
case 3 1.26821e+006 cubic meters
Start
Microsoft Excel - HERM...
ArcView GIS Version 3...
Microsoft PowerPoint - ...
2:37 PM



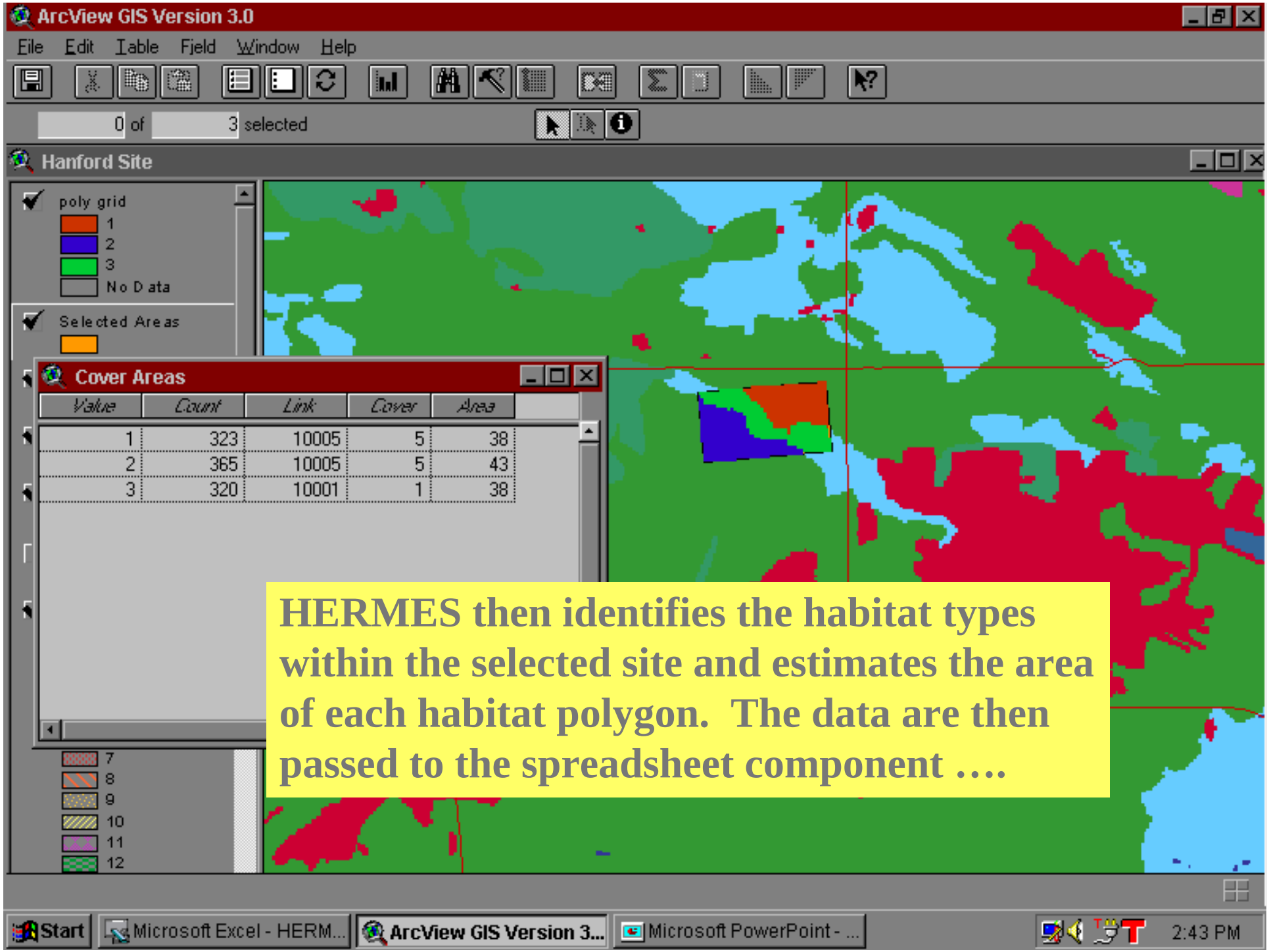
The user provides information about the depth of the burial ground and cover-cap requirements.



HERMES calculates the required area for the burial ground.



The user selects a burial ground location and draws one side. HERMES automatically calculates the other dimension.



HERMES then identifies the habitat types within the selected site and estimates the area of each habitat polygon. The data are then passed to the spreadsheet component ….

Microsoft Excel - HERMES.MOD

File Edit View Insert Format Tools Data Window Help

125%

Geneva 10

E11

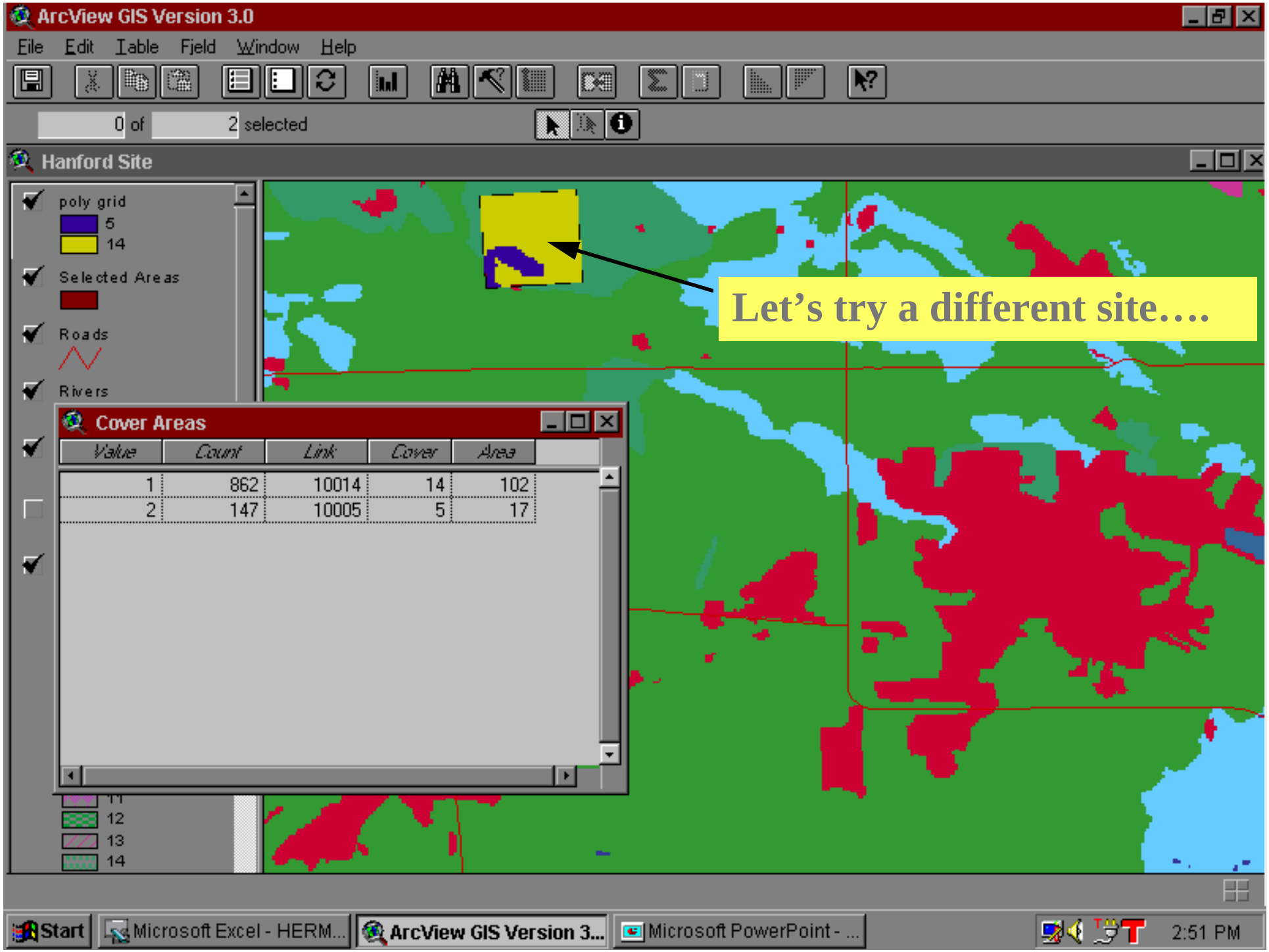
	A	B	C	D	E	F	G
1	Cover Class	Area	Description	Mit Cost	Species Value	Other Value	Total Value
2	1	38	Post-fire shrub-steppe on the Columbia River Plain	$114,000	12444		$126,444
3	5	81	Big Sagebrush-Spiny Hopsage/ Bunchgrasses-Cheatgrass	$729,000	55168		$784,168
4							
5			Total Cost	$843,000	$67,612	$0	**$910,612**
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

Cover Classes / Polygons / C(CovClass) / Pop(CovClass) / C(yi) / P(yi) / Mitigation / U(yi) / Home Range / HSI / SpVal

Ready NUM

Start Microsoft Excel - HER... ArcView GIS Version 3.0 Microsoft PowerPoint - ... 2:46 PM

900 $K -- OUCH!!!


ArcView GIS Version 3.0
File Edit Table Field Window Help
0 of 2 selected
Hanford Site
poly grid
5
14
Selected Areas
Roads
Rivers
Cover Areas
Value Count Link Cover Area
1 862 10014 14 102
2 147 10005 5 17
12
13
14
Let's try a different site….
Start
Microsoft Excel - HERM...
ArcView GIS Version 3...
Microsoft PowerPoint - ...
2:51 PM

Microsoft Excel - HERMES.MOD

File Edit View Insert Format Tools Data Window Help

125%

Geneva 10

E13

	A	B	C	D	E	F	G
1	Cover Class	Area	Description	Mit Cost	Species Value	Other Value	Total Value
2	5	17	Big Sagebrush-Spiny Hopsage/ Bunchgrasses-Cheatgrass	$153,000	10176		$163,176
3	14	102	Cheatgrass-Sandberg's Bluegrass	$0	4408		$4,408
4							
5			Total Cost	$153,000	$14,584	$0	**$167,584**
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

Still expensive, but better.

Cover Classes / Polygons / C(CovClass) / Pop(CovClass) / C(yi) / P(yi) / Mitigation / U(yi) / Home Range / HSI / SpVal

Ready NUM

Start | Microsoft Excel - HER... | ArcView GIS Version 3.0 | Microsoft PowerPoint - ... | 2:53 PM

Potential Extensions

- Analyze habitat value rather than $$ value
- Restore site to any user-selected cover type, regardless of original cover type
- Calculate borrow site dimensions and associated ecological costs
- Calculate engineering costs for infrastructure development (i.e., roads, utilities)
- Include cultural resource concerns

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Use in Risk Assessment

- Exploring integrating HERMES and MEPAS within FRAMES to allow for spatial assessment of ecological/human health risk
- MEPAS would provide spatial grid of contaminant concentrations
- HERMES would provide the area of each habitat type at each concentration level

Use in Risk Assessment - cont'd

- Output of MEPAS/HERMES integration will be used to predict potentially affected species and the number of affected individuals at each concentration level
- Predict changes in habitat value over time due to the contaminants
- Mitigation decisions could be based on habitat value rather than cost-to-replace

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Requirements for Adaptation of HERMES to Other Settings

- Rastorized GIS map of habitat/cover types
- Site-specific framework for habitat restoration / mitigation decision making
- Estimates of costs to perform actions
- List of indicator species
- Estimates of home range and habitat suitability matrix for each species

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