

## Integrated GIS and Modeling Methodologies for Inland Flood Protection Systems

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Sacramento

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## Integrated GIS and Modeling Methodologies for Inland Flood Protection Systems

### Objective

To integrate joint geospatial data access, modeling and decision support aids across Corps of Engineers business practices and to extend existing geospatial display and analysis tools to inland flood protection systems



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## Integrated GIS and Modeling Methodologies for Inland Flood Protection Systems

### Integration of Decision Support Aids/ Joint Data Access

Baseline and dynamic data

Levee Warning Systems

Water control/emergency management/O & M

- CWMS - HEC-FIA, CorpsView, HEC-RAS, etc.
- ENGLink
- OMBIL

Hydrodynamic Modeling



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## Integrated GIS and Modeling Methodologies for Inland Flood Protection Systems

### Extension of Existing Geospatial Display and Analysis Tools

Determine effect of flood protection infrastructure alternatives (levee alignment, levee height)

- Economic
- Environmental

On-the-fly analysis

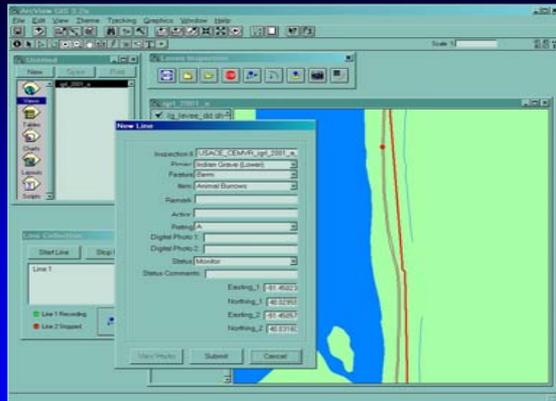
- Levee breach
- Levee overtopping
- Upstream/downstream effects of dam operation



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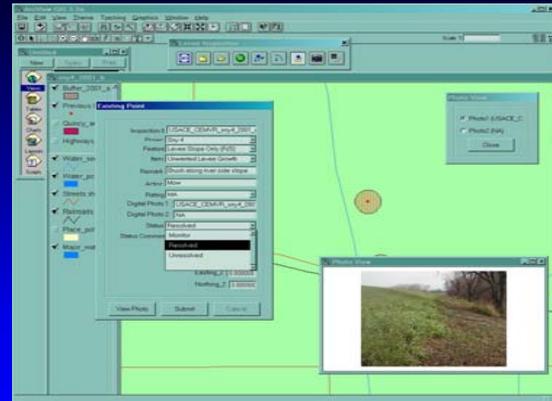
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## New Line Collection and Attribute Entry



Levee Inspection System

## Automated Alert to Previous Inspection Issue



Automated Alert to Previous Inspection Issue

## Inspector Entering Data



Inspector Entering Data

## Digital Photo Management Tool



Digital Photo Management Tool

## Automated Report Table Generation

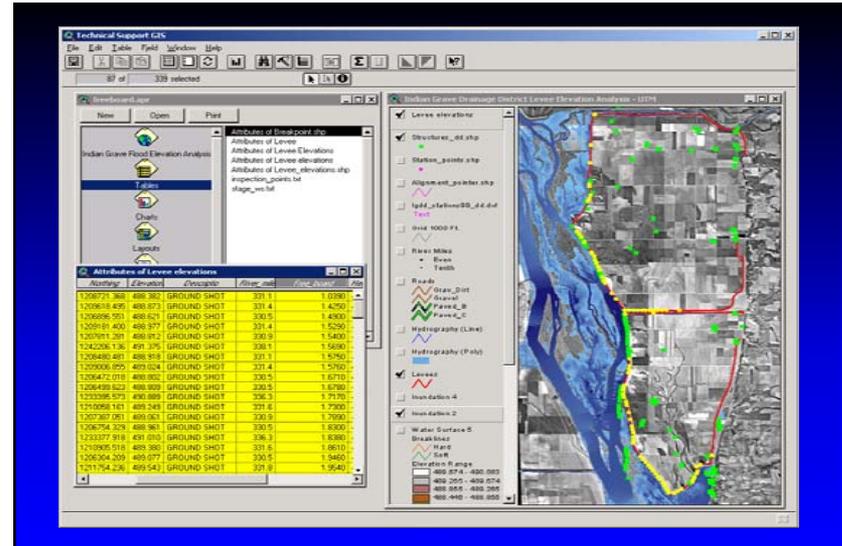
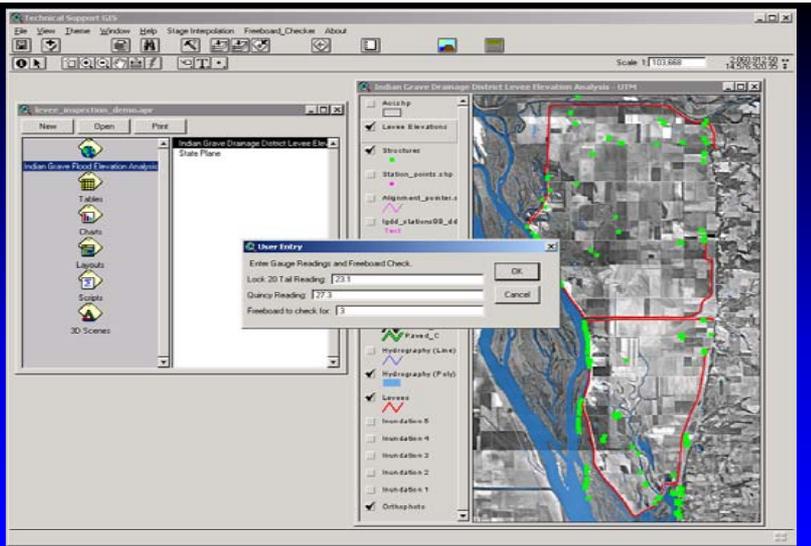
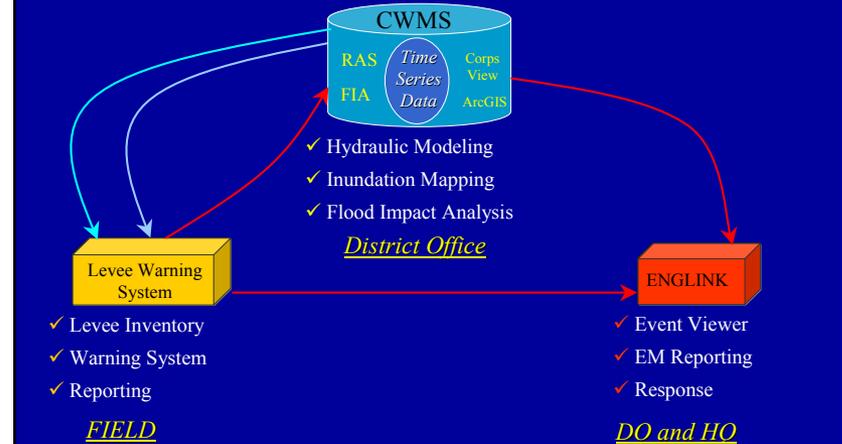
Request ID	Item	Features	Remarks	Action	Photo 1	Photo 2	Rating
STATC_EMFFR_hun_2001_u_2001	Overland Levee Structure	Levee Crown	Medium-sized trees on and side of levee	Remove trees and soil	STATC_EMFFR_hun_2001_u_2001016	RA	0
STATC_EMFFR_hun_2001_u_2002	Overland Levee Structure	Levee Crown	Medium-sized trees on side of levee	Remove trees and soil	STATC_EMFFR_hun_2001_u_2001016	RA	0
STATC_EMFFR_hun_2001_u_2003	Overland Levee Structure	Structure	Woods growth and dense shrubs on top of levee	Remove and apply mulch to soil	STATC_EMFFR_hun_2001_u_2001016	RA	0
STATC_EMFFR_hun_2001_u_2004	Other (Structure Breakdown)	Levee Crown	Sub-standard cut on levee 1/4 mile from station	Re-work with suitable gear such as road roller	STATC_EMFFR_hun_2001_u_2001016	RA	0
STATC_EMFFR_hun_2001_u_2005	Overland Levee Structure	Bank	Large tree on bank	Remove tree and soil	RA	RA	0
STATC_EMFFR_hun_2001_u_2006	Overland Levee Structure	Levee Crown	Medium trees and shrubs on and side of levee	Remove trees and soil	RA	RA	0
STATC_EMFFR_hun_2001_u_2007	Overland Levee Structure	Levee Crown	Overgrown cut on levee	Remove trees and soil	RA	RA	0
STATC_EMFFR_hun_2001_u_2008	Overland Levee Structure	Structure	Woods growth on top	Remove growth and soil	STATC_EMFFR_hun_2001_u_2001016	RA	0

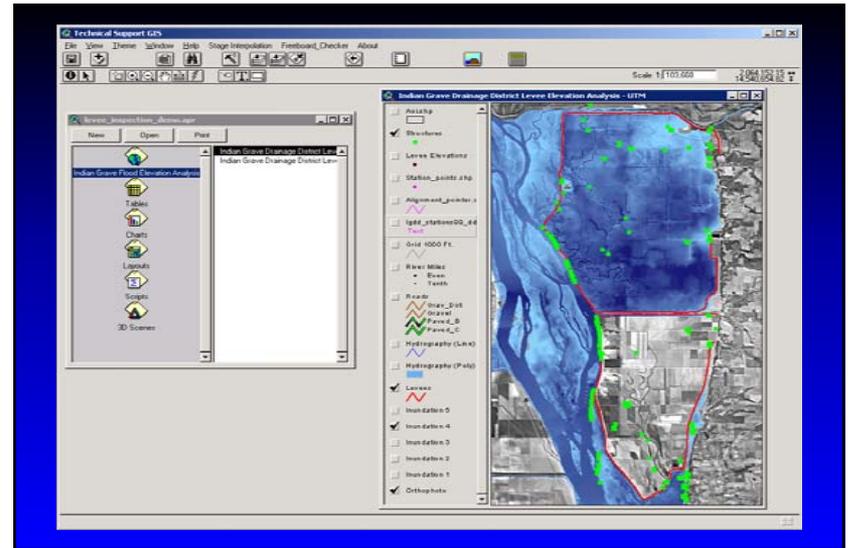
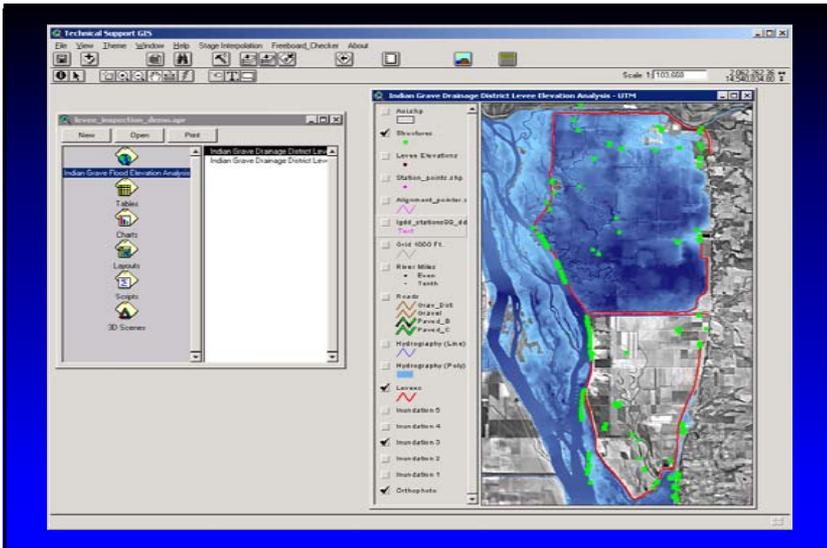
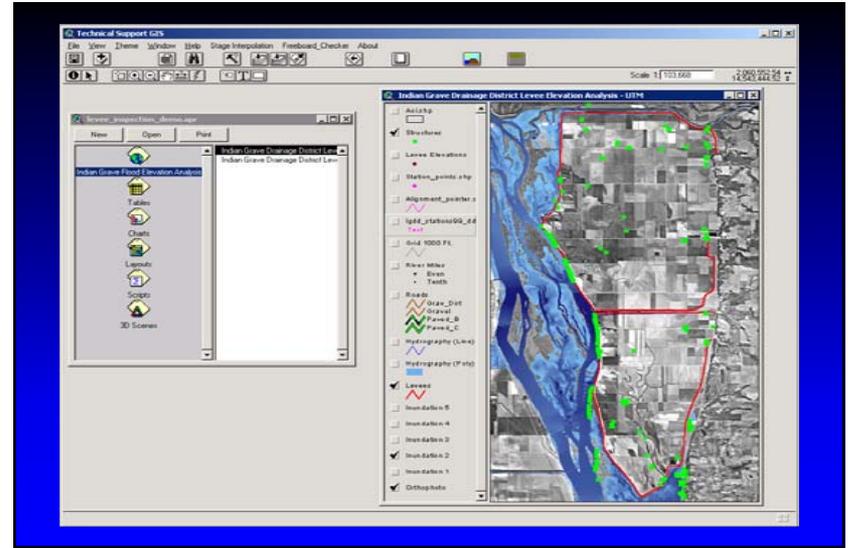
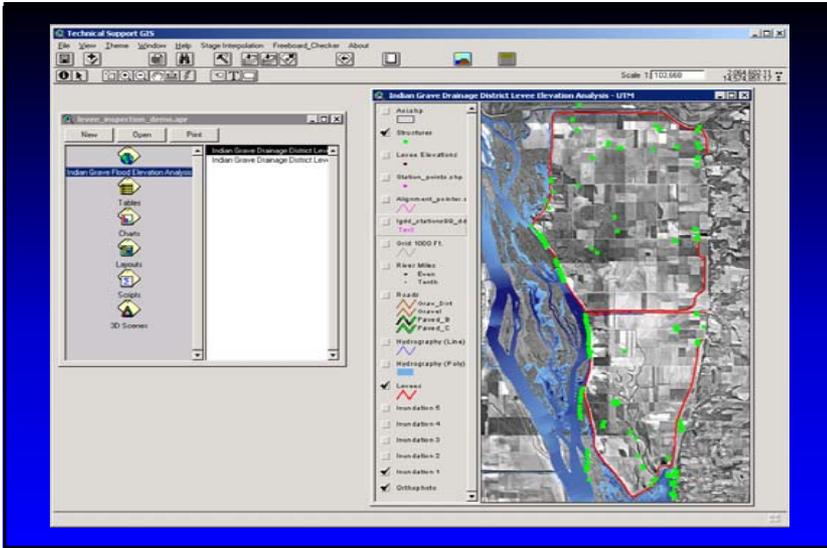


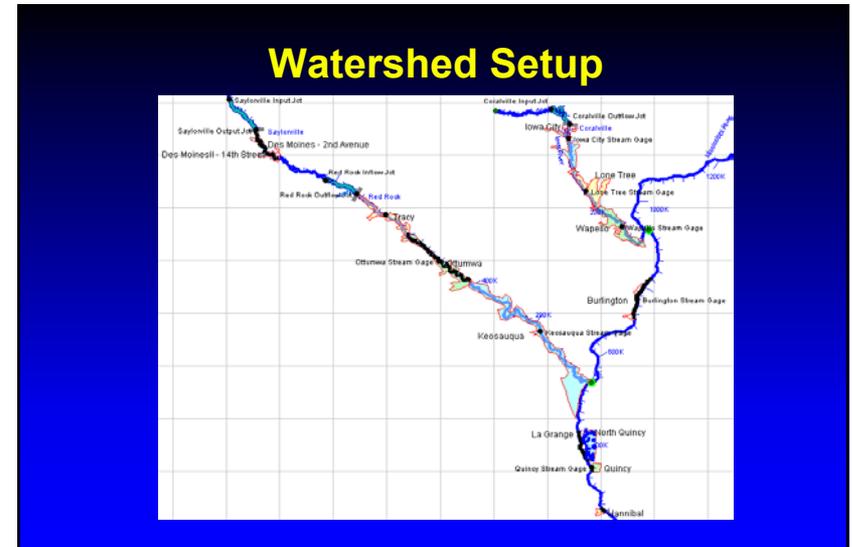
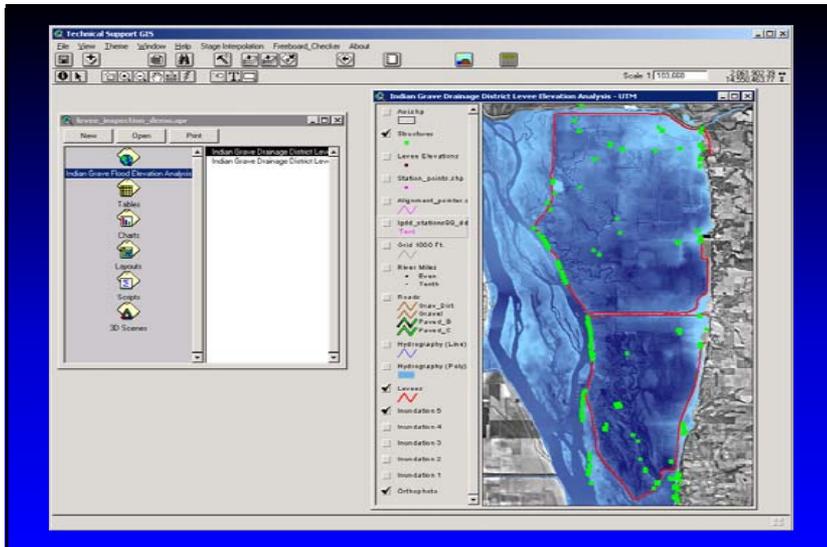
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## SYSTEM SCHEMATIC





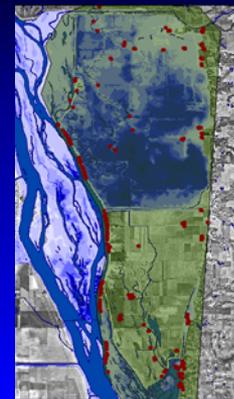


## North Quincy Impact Area



- Stream Coverage
- Orthophoto
- Impact Area
- Structure Inventory

## Levee Failure



- Forecasted Inundated Area
- Stream Coverage
- Orthophoto
- Impact Area
- Structure Inventory

# Damage Computations



# HEC-FIA Damage Summary

Alternative Report - Iowa, DesMoines

Urban | Structures | Agricultural | Summary

View By: Impact Area

Impact Area Summary Report  
for  
Iowa\_DesMoines

Impact Area Name	Impact Area Description	Stream Name	Total Urban Damages (\$1000)	Total Crop Damages (\$1000)	Total Damages (\$1000)	Total Acreage Flooded (acres)
Burlington	Impact area along the Mississippi River for Burlington, IA	Mississippi River	109.21	14.85	124.06	321
Des Moines -	Impact area along Des Moines River from outlet of Stat.	Des Moines River	81,281	34.29	81,315	302
Des Moines -	Impact area along Des Moines River from confluence	Des Moines River	0	0.00	0	0
Hannibal	Impact area along the Mississippi River for Hannibal, M	Mississippi River	21,348	0.00	21,348	0
Iowa City	Impact Area from Coralville Reservoir outlet	Iowa River	1,969	164.32	2,133	2034
Keosauqua	Impact Area along the Des Moines River from Eldon, IA	Des Moines River	18,279	617.53	2,446	6589
La Grange	Impact Area along the Mississippi River for La Grange,	Mississippi River	697	0.00	697	0
Lone Tree	Impact Area along Iowa River from State Highway 22 d.	Iowa River	5,382	287.82	5,669	3709
North Quincy	Impact area along Mississippi River for agricultural are.	Mississippi River	299	164.77	464	2009
Obumwa	Impact Area along the Des Moines River from Eddyville,	Des Moines River	17,731	230.83	17,962	2685
Quincy	Impact Area along the Mississippi River for Quincy, IL	Mississippi River	852	0.00	852	0
Tracy	Impact Area along Des Moines River from outlet of Lak.	Des Moines River	5439	90.45	5,530	1921
Wapella	Impact Area along Iowa River from confluence with Cad	Iowa River	6,375	666.74	7,041	4143
Total			153821	2271.38	156092	23721

Alternative Name: Existing  
 Lookback Date & Time: 21Feb1993 01:00  
 Start Date & Time: 21Feb1993 02:00  
 End Date & Time: 21Nov1993 02:00

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# HEC-FIA Impact Summary

Impact Response Report - Iowa, DesMoines

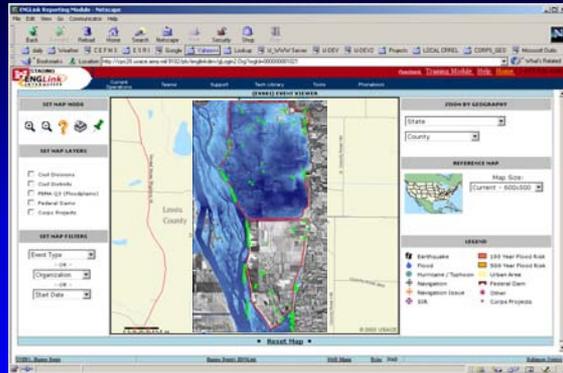
Impact Area	Stage (ft)	Impact	Action	Time
Lone Tree	14.00	Bankfull stage		03Mar1993 04:00
	15.00	Flood stage - represents the stage at ...		03Mar1993 20:00
				Max Flood Stage - 21Nov93, 01:00 22.68 ft
				31Mar1993 19:00
North Quincy	17.50	Alert stage		04Apr1993 20:00
	22.80	Major flood stage		28Jun1993 18:00
	23.70	Lone Star D.D. Private Agricultural Lev...		30Jun1993 07:00
				Max Flood Stage - 21Nov93, 01:00 24.60 ft
				08Mar1993 23:00
Obumwa	9.00	Rural flooding begins		09Mar1993 21:00
	10.00	Flood stage	Bear Creek at b.	30Mar1993 19:00
	11.00	NE side of Rabbit Run floods		18Apr1993 13:00
	12.00	Flooding begins at Eldon, Selma, & D...		19Apr1993 20:00
	13.00	Alert Stage for Obumwa		20Apr1993 00:00
	13.10	Highest stage since Red Rock built		02Jul1993 15:00
	13.50	COE alert stage		03Jul1993 07:00
	14.00		Close interior d.	04Jul1993 02:00
	15.00	Major flood stage		04Jul1993 20:00
	17.00	Pans Street floods		05Jul1993 04:00
	18.00	Property damage in Obumwa begins	CRISP RRR flo.	05Jul1993 08:00
	18.60	Sewer backup reaches street surface		05Jul1993 10:00
19.00	Serious flooding in Obumwa		05Jul1993 14:00	
19.50	Obumwa water pumps endangered	Market Street p.	10Jul1993 21:00	
21.20	Obumwa water supply destroyed (Lun.	Eddyville levee	12Jul1993 00:00	
22.00		Sandbag Vine	Max Flood Stage - 21Nov93, 01:00 22.60 ft	

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# Structure Damage Analysis



# Englink Mission Manager Tools (under development)



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# Englink Mission Manager Tools (under development)

Event Type	Impact Area	Stage (ft)	Impact	Action	Time
SET MAP MARKS	Lone Tree	14.00	Barflood stage		03Mar1993 0400
		19.00	Flood stage - represents the stage of		03Mar1993 2000
SET MAP LAYERS	North County	14.00	Flood stage		03Mar1993 1000
		17.00	Alert stage		04Apr1993 2000
		22.00	Major flood stage		26Jun1993 1900
SET MAP FILTERS		23.75	Lone Star D.D. Private Agricultural Len		03Jun1993 0700
				Major Flood Stage	24Nov93, 01 00 28 00 R
SET MAP FILTERS	Obiluma	8.00	Rural flooding begins		09Mar1993 2300
		10.00	Flood stage		09Mar1993 2100
		11.00	HE side of Hobson Run floods	Near Creek at B.	09Mar1993 1900
		13.00	Flooding begins at Edson, Seama, & D.		10Apr1993 1300
		13.00	Alert stage for Obiluma		10Apr1993 2200
		13.10	Highest stage since Road Rock built		26Apr1993 0000
		13.50	COD alert stage		03Jun1993 1900
		14.00		Close interior	03Jun1993 0700
		15.00	Major flood stage		04Jun1993 0300
		17.00	Plant Street floods		04Jun1993 2000
SET MAP FILTERS	Organization	18.00	Profoundly damaged in Obiluma begins	CH&P Mill Dam	05Jun1993 0400
		18.00	Sewer backup reaches street surface		05Jun1993 0800
		18.00	Severe flooding in Obiluma		05Jun1993 1000
		19.50	Obiluma water pumps endangered	Market Street p.	05Jun1993 1400
		21.20	Obiluma water supply destroyed Jan.	Edonville levee	13Jun1993 2100
	22.00		Sandtrap vlna	13Jun1993 0000	
				Major Flood Stage	24Nov93, 01 00 22 00 R



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# Integrated GIS and Modeling Methodologies for Inland Flood Protection Systems

## Benefits

- Improved Data Collection and Management
- Integration and Improvement of Models
- Automated Procedures for Decision Support



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# Integrated GIS and Modeling Methodologies for Inland Flood Protection Systems

## Milestones

- Complete Initial Demonstration 0206
- Technical Report and Version 2.0 Software 0302
- Complete Broadened Demonstration Project 0402
- Final Report and Software 0409



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# INTEGRATED GIS AND MODELING METHODOLOGIES FOR INLAND FLOOD PROTECTION SYSTEMS

P.I. T. PANGBURN

## OBJECTIVE

To integrate joint geospatial data access, modeling and decision support aids across COE business practices and to extend existing geospatial display and analysis tools to inland flood protection systems

## FY03 PRODUCTS

- Levee Inspection Software
- Levee Warning Software
- TR – Integrated System Demonstration
- TR & V2.0 Software
- Update CWMS, etc.

## APPROACH

- Deliver Levee Inspection Application
- Integrate w/IFP Technologies
- Integrate with H&H, WC and EM
- Demonstrate at COE Districts
- Final Report and Software

## FUNDING

PRIOR	FY02	FY03	FY04	TOTAL
80	250	200	100	630

