Beyond Mapping Compilation Series

by Joseph K. Berry

*…Beyond Mapping columns appearing in GeoWorld (formally GIS World) magazine from **March 1989** through **December 2013**.*

Most GIS applications have focused on mapping and spatial data management for viewing and geo-query of mapped data. Map analysis and GIS modeling involve entirely new spatial reasoning concepts and procedures that are not reflected in our paper map legacy. The four books in the Beyond Mapping Compilation Series are based on Joe Berry's popular "Beyond Mapping" columns in GIS World/GeoWorld magazine that discusses the new breed of map analysis tools, how they can be used to better characterize and communicate spatial relationships, be organized into effective GIS model solutions, and spark entirely new spatial paradigms. The topics covered are written for novices, as well as GIS professionals, in a witty style that entertains as well as informs.

*(click to access additional **Chronological, Operations, Interactive** and **Index Listings** with hyperlinks to individual Beyond Mapping columns)*

*(click for a hardcopy version of this document posted at **http://www.innovativegis.com/basis/BeyondMappingSeries/**)*

Applications Listing

with hyperlinks to individual Beyond Mapping columns

*The following **Application Listing** contains all of Beyond Mapping (BM) columns appearing in GeoWorld from 1989 through 2013 alphabetically sorted into the twenty-three major application groupings identified below (< click> on any of the items to jump to that grouping)—*

*Note: The colors in column 1 and 5 indicate the book— blue= Book IV, **GIS Modeling**; Salmon= Book III, **Map Analysis**; green= Book II, **Spatial Reasoning**; and, Grey= Book I, **Beyond Mapping**. When viewing the results of sorting on Groupings of Approaches and Operations or Application Areas the colors are helpful in quickly identifying the Book associated with each record (original Beyond Mapping column) appearing in the reorganized listing.*

Date Code (Col 1)	**Month** (Col 2)	**Year** (Col 3)	**Column Title/Description** (Col 4)	**Book/ Topic/Section** (Col 5)	**Groupings of Operations** (Col 6)	**Groupings of Applications** (Col 7)
2013.10	**October**	**2013**	Laying the Foundation for SpatialSTEM: *Spatial Mathematics, Map Algebra and Map Analysis — discusses the conceptual foundation and intellectual shifts needed for SpatialSTEM*	**Topic 9, S6**	ConceptualFramework_Operations	**Basic_ConceptsAnalyticalOperations**
2013.02	**February**	**2013**	Recasting Map Analysis Operations for General Consumption — *reorganizes ArcGIS's Spatial Analyst tools into the SpatialSTEM framework that extends traditional math/stat procedures*	**B4, Topic 9, Further Reading4**	ConceptualFramework_Operations	Basic_ConceptsAnalyticOperations
2012.07	**July**	**2012**	Narrowing-In on Absurd Gerrymanders — *discusses how a Narrowness Index (NI) can be applied to assess redistricting configurations*	**B4, Topic 2, S5**	Reclassify_shape	Basic_ConceptsAnalyticOperations
2011.06	**June**	**2011**	Breaking Away from Breakpoints — *describes the use of curve-fitting to derive continuous equations for suitability model ratings*	**B4, Topic 4, Further Reading3**	Map_Normalization	Basic_ConceptsAnalyticOperations
2011.05	**May**	**2011**	Correlating Maps and a Numerical Mindset — *describes a Spatially Localized Correlation procedure for mapping the mutual relationship between two map variables*	**B4, Topic 4, S4**	SpatialDataMining_PredictiveStatistics	Basic_ConceptsAnalyticOperations
2011.04	**April**	**2011**	Comparing Apples and Oranges — *describes a Standard Normal Variable (SNV) procedure for normalizing maps for comparison*	**B4, Topic 4, Further Reading2**	Map_Normalization	Basic_ConceptsAnalyticOperations
2011.03	**March**	**2011**	A Dynamic Tune-up for Distance Calculations — *describes the algorithms for dynamic effective distance procedures involving intervening conditions*	**B4, Topic 2, S2**	Distance_EffectiveProximity	Basic_ConceptsAnalyticOperations
2006.07	**July**	**2006**	Statistically Compare Discrete Maps — *discusses procedures for comparing*	**B3, Topic 10, S1**	Map_ComparisonDiscreteData	Basic_ConceptsAnalyticOperations

			discrete maps			
2006.06	***June***	***2006***	Under the Hood of Spatial Interpolation — *investigates the basic concepts in IDW and Kriging interpolation procedures*	***B3, Topic 9, S3***	SurfaceModeling_Interpolation	Basic_ConceptsAnalyticOperations
2006.05	***May***	***2006***	The Average Is Hardly Anywhere — *discusses the difference between spatial and non-spatial data distributions*	***B3, Topic 9, S2***	SurfaceModeling_Interpolation	Basic_ConceptsAnalyticOperations
2006.04	***April***	***2006***	Key Concepts Characterize Unique Conditions — *describes a technique for handling unique combinations of map layers*	***B3, Topic 3, Further Reading1***	Overlay_CellbyCellCoincidence	Basic_ConceptsAnalyticOperations
2005.12	***December***	***2005***	Filtering for the Good Stuff — *investigates a couple of spatial filters for assessing neighborhood connectivity and variability*	***B3, Topic 6 , Further Reading3***	Neighborhood_Summary	Basic_ConceptsAnalyticOperations
2005.11	***November***	***2005***	Milking Spatial Context Information — *describes a procedure for deriving a customer density surface*	***B3, Topic 6, S2***	Neighborhood_Summary	Basic_ConceptsAnalyticOperations
2005.07	***July***	***2005***	Calculate and Compare to Find Effective Proximity — *describes how effective proximity is calculated*	***B3, Topic 4, Further Reading2***	Distance_EffectiveProximity	Basic_ConceptsAnalyticOperations
2005.06	***June***	***2005***	Extend Simple Proximity to Effective Movement — *discusses the concept of effective distance responding to relative and absolute barriers*	***B3, Topic 4, S4***	Distance_EffectiveProximity	Basic_ConceptsAnalyticOperations
2005.05	***May***	***2005***	Use Cells and Rings to Calculate Simple Proximity — *describes how simple proximity is calculated*	***B3, Topic 4, Further Reading1***	Distance_EffectiveProximity	Basic_ConceptsAnalyticOperations
2005.04	***April***	***2005***	Measuring Distance Is Neither Here nor There — *discusses the basic concepts of distance and proximity*	***B3, Topic 4, S3***	Distance_EffectiveProximity	Basic_ConceptsAnalyticOperations
2005.03	***March***	***2005***	Making Space for Mapped Data — *investigates the link between geographic space and data space for mapping data patterns*	***B3, Topic 2, S4***	SpatialDataMining_Clustering	Basic_ConceptsAnalyticOperations
2005.02	***February***	***2005***	Use Spatial Statistics to Map Abnormal Averages — *discusses surface modeling to characterize the spatial distribution inherent in a data set*	***B3, Topic 2, S3***	SurfaceModeling_Interpolation	Basic_ConceptsAnalyticOperations
2005.01	***January***	***2005***	Bending Our Understanding of Distance	***B3, Topic 2,***	Distance_EffectiveProximity	Basic_ConceptsAnalyticOperations

			— uses effective distance in establishing erosion setback to demonstrate spatial analysis	***S2***		
2004.09	***September***	***2004***	Use “Shadow Maps” to Understand Overlay Errors *— describes how shadow maps of certainty can be used to estimate error and its propagation*	***B3, Topic 3, Further Reading2***	Overlay_CellbyCellCoincidence	Basic_ConceptsAnalyticOperations
2004.06	***June***	***2004***	Computers Quickly Characterize Spatial Coincidence *— discusses several human considerations in implementing GIS*	***B3, Topic 3, S4***	Overlay_CellbyCellCoincidence	Basic_ConceptsAnalyticOperations
2004.05	***May***	***2004***	Overlay Operations Feature a Variety of Options *— discusses the basic overlaying map operations*	***B3, Topic 3, S3***	Overlay_CellbyCellCoincidence	Basic_ConceptsAnalyticOperations
2004.04	***April***	***2004***	Options Seem Endless When Reclassifying Maps *— discusses the basic reclassifying map operations*	***B3, Topic 3, S2***	Reclassify_InitialValue	Basic_ConceptsAnalyticOperations
2003.10	***October***	***2003***	Think with Maps to Evaluate Alternative Routes *— describes procedures for comparing routes*	***B3, Topic 8, S4***	Distance_Routing	Basic_ConceptsAnalyticOperations
2003.09	***September***	***2003***	A Recipe for Calibrating and Weighting GIS Model Criteria *— identifies procedures for calibrating and weighting map layers in GIS models*	***B3, Topic 8, S3***	Distance_Routing	Basic_ConceptsAnalyticOperations
2003.08	***August***	***2003***	Consider Multi-Criteria When Routing *— discusses the construction of a discrete “cost/avoidance” map and optimal path corridors*	***B3, Topic 8, S2***	Distance_Routing	Basic_ConceptsAnalyticOperations
2003.07	***July***	***2003***	A Three-Step Process Identifies Preferred Routes *— describes the basic steps in Least Cost Path analysis*	***B3, Topic 8, S1***	Distance_Routing	Basic_ConceptsAnalyticOperations
2003.04	***April***	***2003***	Multiple Methods Help Organize Raster Data *— discusses different approaches to storing raster data*	***B3, Topic 1, Further Reading1***	DataConsiderations_Structure	Basic_ConceptsAnalyticOperations
2003.03	***March***	***2003***	Try Vulnerability Maps to Visualize Aesthetics *— describes a procedure for deriving an aesthetics map based on visual exposure to pretty and ugly places*	***B3, Topic 5, Further Reading2***	Distance_VisualExposure	Basic_ConceptsAnalyticOperations
2003.02	***February***	***2003***	Use Maps to Assess Visual Vulnerability *— discusses a procedure for identifying*	***B3, Topic 5, Further Reading1***	Distance_VisualExposure	Basic_ConceptsAnalyticOperations

			visually vulnerable areas			
2003.01	***January***	***2003***	Beware of Slope's Slippery Slope — *describes various slope calculations and compares results*	***B3, Topic 6, Further Reading7***	Neighborhood_Configuration	Basic_ConceptsAnalyticOperations
2002.12	***December***	***2002***	Use Surface Area for Realistic Calculations — *describes a technique for adjusting planimetric area to surface area considering terrain slope*	***B3, Topic 6, Further Reading8***	Neighborhood_Summary	Basic_ConceptsAnalyticOperations
2002.10	***October***	***2002***	Accumulation Surfaces Connect Bus Riders and Stops — *discusses an accumulation surface analysis procedure for linking riders with bus stops*	***B3, Topic 4, Further Reading8***	Distance_Routing	Basic_ConceptsAnalyticOperations
2001.08	***August***	***2001***	Use Exposure Maps and Fat Buttons to Assess Visual Impact — *investigates procedures for assessing visual exposure*	***B3, Topic 5, S4***	Distance_VisualExposure	Basic_ConceptsAnalyticOperations
2001.07	***July***	***2001***	Visual Exposure is in the Eye of the Beholder — *describes procedures for assessing visual impact and creating simple models*	***B3, Topic 5, S3***	Distance_VisualExposure	Basic_ConceptsAnalyticOperations
2001.06	***June***	***2001***	Identify and Use Visual Exposure to Create Viewshed Maps — *discusses basic considerations and procedures for establishing visual connectivity*	***B3, Topic 5, S2***	Distance_VisualExposure	Basic_ConceptsAnalyticOperations
2001.05	***May***	***2001***	Consider Slope and Scenic Beauty in Deriving Hiking Maps — *describes a general procedure for weighting friction maps to reflect different objectives*	***B3, Topic 4, Further Reading7***	Distance_Routing	Basic_ConceptsAnalyticOperations
2001.04	***April***	***2001***	Derive and Use Hiking-Time Maps for Off-Road Travel — *discusses procedures for establishing hiking-time buffers responding to off-road travel*	***B3, Topic 4, Further Reading6***	Distance_Routing	Basic_ConceptsAnalyticOperations
2001.01	***January***	***2001***	Create Effective Distance Buffers to Improve Map Accuracy — *develops procedures for creating buffers that respond to the relative ease of movement*	***B3, Topic 4, S2***	Distance_TravelTime	Basic_ConceptsAnalyticOperations
2000.12	***December***	***2000***	Line-of-Sight Buffers Add Intelligent to Maps — *describes procedures for creating buffers that track relative visual*	***B3, Topic 5, S1***	Distance_VisualExposure	Basic_ConceptsAnalyticOperations

			exposure and noise levels			
2000.11	***November***	***2000***	Extending GIS Procedures with Variable-Width Buffers *— discusses the basic considerations in establishing variable-width buffers that respond to both intervening conditions and the type of connectivity*	***B3, Topic 4, S1***	Distance_EffectiveProximity	Basic_ConceptsAnalyticOperations
1999.10	***October***	***1999***	Use Statistics to Compare Map Surfaces *— describes several techniques for comparing continuous map surfaces*	***B3, Topic 10, Further Reading6***	Map_ComparisonContinuousData	Basic_ConceptsAnalyticOperations
1999.09	***September***	***1999***	Compare Maps by the Numbers *— describes several techniques for comparing discrete maps*	***B3, Topic 10, Further Reading5***	Map_ComparisonDiscreteData	Basic_ConceptsAnalyticOperations
1995.021	***February***	***1995***	Dodge the GIS Modeling Babble Ground *— identifies a Classification Guide for categorizing GIS models*	***B2, Topic 5, S2***	ConceptualFramework_Operations	Basic_ConceptsAnalyticOperations
1994.09	***September***	***1994***	Avoid Dis-Information *— describes the calculation of a localized Coefficient of Variance map*	***B2, Topic 4, S3***	Map_Normalization	Basic_ConceptsAnalyticOperations
1994.08	***August***	***1994***	Spawning Uncertainty *— identifies a procedure for tracking error propagation in map overlay*	***B2, Topic 4, S2***	Overlay_CellbyCellCoincidence	Basic_ConceptsAnalyticOperations
1994.07	***July***	***1994***	The This, That, There Rule *— describes creating a "Shadow Map of Certainty" that characterizes the spatial distribution of probable error*	***B2, Topic 4, S1***	Overlay_CellbyCellCoincidence	Basic_ConceptsAnalyticOperations
1994.03	***March***	***1994***	Maneuvering on GIS's Sticky Floor *— describes Inverse Distance, Kriging, and Minimum Curvature techniques for surface modeling*	***B2, Topic 2, S3***	SurfaceModeling_Interpolation	Basic_ConceptsAnalyticOperations
1993.01	***January***	***1993***	Take a New Look at Visual Connectivity *— describes viewshed and visual exposure procedures*	***B1, Topic 9, S5***	Distance_VisualExposure	Basic_ConceptsAnalyticOperations
1992.12	***December***	***1992***	Twists and Contortions Lead to Connectivity *— describes procedures for calculating optimal paths and routing corridors*	***B1, Topic 9, S4***	Distance_Routing	Basic_ConceptsAnalyticOperations
1992.11	***November***	***1992***	Rubber Rulers Fit Reality Better *— describes procedures for calculating*	***B1, Topic 9, S3***	Distance_EffectiveProximity	Basic_ConceptsAnalyticOperations

			effective distance that considers intervening absolute and relative barriers			
1992.10	***October***	***1992***	Distance Is Simple and Straight Forward *— describes simple distance calculation as a propagating wavefront*	***B1, Topic 9, S2***	Distance_EffectiveProximity	Basic_ConceptsAnalyticOperations
1992.09	***September***	***1992***	There's More Than One Way to Figure Slope *— describes procedures for calculating surface slope and its varied applications*	***B1, Topic 9, S1***	Neighborhood_Configuration	Basic_ConceptsAnalyticOperations
1992.04	***April***	***1992***	If I Hadn't of Believed It, I Wouldn't Have Seen It *— discusses map-wide overlay techniques and the spatial evaluation of algebraic equations, such as regression*	***B1, Topic 7, S3***	Overlay_MapWide	Basic_ConceptsAnalyticOperations
1992.03	***March***	***1992***	Map Overlay Techniques— there's more than one *— discusses region-wide summary and map coincidence techniques*	***B1, Topic 7, S2***	Overlay_RegionWide	Basic_ConceptsAnalyticOperations
1992.02	***Feb****/Jan*	***1992***	Characterizing Spatial Coincidence the Computer's Way *— describes point-by-point overlay techniques*	***B1, Topic 7, S1***	Overlay_CellbyCellCoincidence	Basic_ConceptsAnalyticOperations
1991.12	***December***	***1991***	Analyzing the Non-Analytical *— describes how "joint probability of coincidence" and "minimum mapping resolution" can be used to assess results of overlaying maps*	***B1, Topic 6, S2***	Overlay_CellbyCellCoincidence	Basic_ConceptsAnalyticOperations
1991.11	***November***	***1991***	GIS Facilitates Error Assessment *— discusses potential sources of error when overlaying maps and how "shadow maps" of error and "fuzzy theory" can shed light on the problem*	***B1, Topic 6, S1***	Overlay_CellbyCellCoincidence	Basic_ConceptsAnalyticOperations
1991.10	***October***	***1991***	Discovering Feature Patterns *— describes procedures for assessing landscape pattern (Spacing and Contiguity)*	***B1, Topic 5, S3***	Reclassify_Contiguity	Basic_ConceptsAnalyticOperations
1991.09	***September***	***1991***	You Can't See the Forest for the Trees *— discusses indices of feature shape (Boundary Configuration and Spatial Integrity)*	***B1, Topic 5, S2***	Reclassify_Shape	Basic_ConceptsAnalyticOperations
1991.08	***August***	***1991***	Need to Ask the Right Questions Takes You Beyond Mapping *— describes indices of map variability (Neighborhood*	***B1, Topic 5, S1***	Neighborhood_Summary	Basic_ConceptsAnalyticOperations

			Complexity and Comparison)			
1991.07	***July***	***1991***	*Special URISA Issue — no BM column; special supplement made available,* A Mathematical Structure for Analyzing Maps*— a 1986 journal article establishing a framework for map analysis/modeling*	***B1, Epilog, S3***	ConceptualFramework_Operations	Basic_ConceptsAnalyticOperations
1990.12	***December***	***1990***	I Don't Do Windows *— describes procedures for summarizing weighted roving windows*	***B1, Topic 3, S4***	Neighborhood_Summary	Basic_ConceptsAnalyticOperations
1990.10	***Oct****/Nov*	***1990***	Torture Numbers, They'll Tell you Anything *— discusses the underlying theory and basic considerations of spatial interpolation*	***B1, Topic 3, S3***	SurfaceModeling_Interpolation	Basic_ConceptsAnalyticOperations
1990.08	***Aug****/Sep*	***1990***	It's Like the New Math, I am Just Too Old *— discusses the concept of calculating a "map derivative" and its use*	***B1, Topic 3, S2***	Neighborhood_Configuration	Basic_ConceptsAnalyticOperations
1990.06	***Jun****/July*	***1990***	Imagination is More Important than Information *— describes procedures for characterizing surface configuration (slope, aspect and profile)*	***B1, Topic 3, S1***	Neighborhood_Configuration	Basic_ConceptsAnalyticOperations
1990.04	***Apr****/May*	***1990***	There's Only One Problem Having All this Sophisticated Equipment *— discusses the basic approaches used for calculating narrowness and visual connectivity*	***B1, Topic 2, S4***	Distance_Narrowness	Basic_ConceptsAnalyticOperations
1990.02	***Feb****/Mar*	***1990***	Keep It Simple Stupid (KISS) *— describes the use of "accumulation surfaces" for deriving optimal path density and Nth best paths*	***B1, Topic 2, S3***	Distance_AccumulationSurface	Basic_ConceptsAnalyticOperations
1989.11	***Nov****/Dec*	***1989***	As the Crow Walks *— describes the use of "propagating waves" for calculating effective distance and optimal paths*	***B1, Topic 2, S2***	Distance_EffectiveProximity	Basic_ConceptsAnalyticOperations
1989.09	***Sep****/Oct*	***1989***	You Can't Get There from Here *— introduces the similarities and differences between "simple" and "effective" distance measurement*	***B1, Topic 2, S1***	Distance_EffectiveProximity	Basic_ConceptsAnalyticOperations
2013.05	***May***	***2013***	Mixing It up in GIS Modeling's Kitchen *— an overview of map analysis and GIS modeling considerations*	***B4, Topic 5, S1***	Overview	**Basic_ConceptsApproach**
2013.03	***March***	***2013***	Depending on Where is What *— develops*	***B4, Topic 9, S5***	DataConsiderations_Structure	Basic_ConceptsApproach

			an organizational structure for spatial statistics			
2011.11	***November***	***2011***	Contour Lines versus Color Gradients for Displaying Spatial Information — *discusses the similarities and differences between discrete contour line and continuous gradient procedures for visualizing map surfaces*	***B4, Topic 1, S4***	Display_2D3D	Basic_ConceptsApproach
2010.10	***October***	***2010***	Putting GIS Modeling Concepts in Their Place — *develops a typology of GIS modeling types and characteristics*	***B4, Topic 5, S4***	ConceptualFramework_Modeling	Basic_ConceptsApproach
2009.04	***April***	***2009***	What's Missing in Mapping? — *discusses the need for identifying data dispersion as well as average in Thematic Mapping*	***B4, Topic 4, S1***	Overlay_RegionWide	Basic_ConceptsApproach
2004.12	***December***	***2004***	Moving Mapping to Analysis of Mapped Data — *describes Spatial Analysis and Spatial Statistics as extensions to traditional mapping and statistics*	***B3, Topic 2, S1***	General_Overview	Basic_ConceptsApproach
2003.06	***June***	***2003***	Use Mapping "Art" to Visualize Values — *describes procedures for generating contour maps*	***B3, Topic 1, Further Reading2***	Display_2D3D	Basic_ConceptsApproach
2001.09	***September***	***2001***	Use Polar Variograms to Assess Distance and Direction Dependencies — *discuses a procedure to incorporate direction as well as distance for assessing spatial dependency*	***B3, Topic 9, Further Reading10***	SurfaceModeling_Interpolation	Basic_ConceptsApproach
1999.01	***January***	***1999***	Extending Spatial Dependency to Maps — *describes a technique for generating a map of spatial autocorrelation*	***B3, Topic 9, Further Reading9***	SurfaceModeling_Interpolation	Basic_ConceptsApproach
1998.12	***December***	***1998***	Measuring Spatial Dependency — *describes the basic measures of autocorrelation*	***B3, Topic 9, Further Reading8***	SurfaceModeling_Interpolation	Basic_ConceptsApproach
1998.11	***November***	***1998***	Unlocking the Keystone Concept of Spatial Dependency — *discusses spatial dependency and illustrates the effects of different spatial arrangements of the same set of data*	***B3, Topic 9, Further Reading7***	SurfaceModeling_Interpolation	Basic_ConceptsApproach
1998.07	***July***	***1998***	Explore Data Space — *establishes the concept of "data space" and how mapped data conforms to this fundamental view*	***B3, Topic 10, Further Reading3***	Processing_Approaches	Basic_ConceptsApproach

1998.06	***June***	***1998***	Link Data and Geographic Distributions — *describes the direct link between numeric and geographic distributions*	***B3, Topic 10, Further Reading2***	Processing_Approaches	Basic_ConceptsApproach
1998.05	***May***	***1998***	Beware the Slippery Surfaces of GIS Modeling — *discusses the relationships among maps, map surfaces and data distributions*	***B3, Topic 10, Further Reading1***	Processing_Approaches	Basic_ConceptsApproach
1998.01	***January***	***1998***	Analyzing Stepped Accumulation Surfaces — *describes a technique for forcing an optimal path through a series of points*	***B3, Topic 8, Further Reading7***	Distance_AccumulationSurface	Basic_ConceptsApproach
1997.12	***December***	***1997***	Determining Optimal Path Corridors — *describes a technique for determining the set of n^{th} best paths between two points*	***B3, Topic 8, Further Reading6***	Distance_AccumulationSurface	Basic_ConceptsApproach
1997.11	***November***	***1997***	Analyzing Accumulation Surfaces — *describes how two surfaces can be analyzed to determine the relative travel-time advantages*	***B3, Topic 8, Further Reading5***	Distance_AccumulationSurface	Basic_ConceptsApproach
1997.10	***October***	***1997***	Building Accumulation Surfaces — *reviews how proximity analysis and effective distance is used to construct accumulation surfaces*	***B3, Topic 8, Further Reading4***	Distance_AccumulationSurface	Basic_ConceptsApproach
1997.07	***July***	***1997***	Uncovering the Mysteries of Spatial Autocorrelation — *describes approaches used in assessing spatial autocorrelation*	***B3, Topic 9, Further Reading6***	SurfaceModeling_Interpolation	Basic_ConceptsApproach
1997.05	***May***	***1997***	Depending on the Data — *discusses the fundamental concepts of spatial dependency*	***B3, Topic 9, Further Reading5***	SurfaceModeling_Interpolation	Basic_ConceptsApproach
1997.04	***April***	***1997***	Comparing Map Errors — *describes how normalized maps of error can be used to visualize the differences in error surfaces*	***B3, Topic 9, Further Reading2***	SurfaceModeling_Accuracy	Basic_ConceptsApproach
1997.03	***March***	***1997***	Move Beyond a Map Full of Errors — *discusses a technique for generating a "shadow map" of error*	***B3, Topic 9, Further Reading1***	SurfaceModeling_Accuracy	Basic_ConceptsApproach
1997.02	***February***	***1997***	Justifiable Interpolation — *describes the "Residual Analysis" procedure for assessing interpolation performance*	***B3, Topic 9, S4***	SurfaceModeling_Accuracy	Basic_ConceptsApproach
1997.01	***January***	***1997***	Designer Samples — *describes different sampling patterns and their relative*	***B3, Topic 9, Further Reading4***	SurfaceModeling_PointSampling	Basic_ConceptsApproach

			advantages			
1996.12	***December***	***1996***	What's the Point? — *discusses the general considerations in point sampling design*	***B3, Topic 9, Further Reading3***	SurfaceModeling_PointSampling	Basic_ConceptsApproach
1996.03	***March***	***1996***	Classifying the Analytical Capabilities of GIS — *discusses the differences and similarities in the Berry and Tomlin map analysis classification schemes*	***B2, Topic 7, S2***	ConceptualFramework_Operations	Basic_ConceptsApproach
1995.10	***October***	***1995***	GIS and Remote Sensing Share a Lofty Marriage — *identifies the basic concepts, principles and theoretical underpinnings of Remote Sensing (RS) technology*	***B2, Topic 9, S2***	SpatialDataMining_Classification	Basic_ConceptsApproach
1994.10	***October***	***1994***	*Empirical Verification Assesses Mapping Performance* — *describes procedures for assessing mapping performance through Error Matrix (discrete) and Residual Analysis (continuous)*	***B2, Topic 4, S4***	DataConsiderations_Accuracy	Basic_ConceptsApproach
1994.02	***February***	***1994***	Surf's Up — *fitting continuous map surfaces to geographic data distributions*	***B2, Topic 2, S2***	SurfaceModeling_Interpolation	Basic_ConceptsApproach
1994.01	***January***	***1994***	Averages Are Mean — *compares nonspatial and spatial distributions of field data*	***B2, Topic 2, S1***	General_Overview	Basic_ConceptsApproach
1993.02	***February***	***1993***	GIS Mirrors Perceptions of Decision Criteria — *describes a flowcharting procedure that expresses GIS model logic in a clear and concise form*	***B1, Topic 10, S1***	ConceptualFramework_Modeling	Basic_ConceptsApproach
2013.09	***September***	***2013***	The Spatial Key to Seeing the Big Picture — *describes a five step process for generating grid map layers from spatially tagged data*	***B4, Topic 9, Further Reading3***	DataConsiderations_Structure	**Basic_ConceptsData**
2013.06	***June***	***2013***	Setting a Place at the Table for Grid-based Data — *describes the differences between individual file and table storage approaches*	***B4, Topic 1, S4***	DataConsiderations_Structure	Basic_ConceptsData
2012.10	***October***	***2012***	To Boldly Go Where No Map Has Gone Before — *identifies Lat/Lon as a Universal Spatial Key for joining database tables*	***B4, Topic 9, S4***	DataConsiderations_Structure	Basic_ConceptsData
2012.09	***September***	***2012***	Organizing Geographic Space for	***B4, Topic 1, S1***	DataConsiderations_Structure	Basic_ConceptsData

			Effective Analysis — *an overview of data organization for grid-based map analysis*			
2011.12	***December***	***2011***	VtoR and Back! — *describes various techniques for converting between vector and raster data types*	***B4, Topic 1, S3***	DataConsiderations_Structure	Basic_ConceptsData
2011.10	***October***	***2011***	The Universal Key for Unlocking GIS's Full Potential — *outlines a global referencing system approach compatible with standard DBMS systems*	***B4, Topic 7, S6***	DataConsiderations_Structure	Basic_ConceptsData
2009.12	***December***	***2009***	From a Map Pancake to a Soufflé — *continues the discussion of concepts and configuration of a 3D GIS*	***B4, Topic 10, Further Reading1***	DataConsiderations_Structure	Basic_ConceptsData
2009.11	***November***	***2009***	Thinking Outside the Box — *discusses concepts and configuration of 3-dimensional geography*	***B4, Topic 10, S4***	DataConsiderations_Structure	Basic_ConceptsData
2009.10	***October***	***2009***	Visualizing a Three-dimensional Reality — *uses visual connectivity to introduce and reinforce the paradigm of three-dimension geography*	***B4, Topic 10, S3***	DataConsiderations_Structure	Basic_ConceptsData
2008.02	***February***	***2008***	How to Determine Exactly "Where Is What" — *discusses the levels of precision (correct placement) and accuracy (correct characterization)*	***B4, Topic 5, S2***	DataConsiderations_Accuracy	Basic_ConceptsData
2007.05	***May***	***2007***	Getting the Numbers Right — *describes a classification scheme for map analysis operations based on how map values are retrieved for processing (Local, Focal, Zonal)*	***B4, Topic 5, S3***	DataConsiderations_Structure	Basic_ConceptsData
2007.04	***April***	***2007***	Geo-Referencing Is the Cornerstone of GIS — *describes current and alternative approaches for referencing geographic and abstract space*	***B4, Intro,S3***	DataConsiderations_Structure	Basic_ConceptsData
2007.03	***March***	***2007***	Understand Resolution to "Think with Maps" — *discusses the factors that determine the "informational scale" digital maps*	***B4, Intro, S2***	DataConsiderations_Accuracy	Basic_ConceptsData
2007.02	***February***	***2007***	Finding Common Ground in Paper and Digital Worlds — *describes the similarities and differences in information and organization between traditional paper*	***B4, Intro, S1***	DataConsiderations_Structure	Basic_ConceptsData

			and digital maps			
2002.07	***July***	***2002***	Grids and Lattices Build Visualizations — *describes Lattice and Grid forms of map surface display*	***B3, Topic 1, S1***	Display_2D3D	Basic_ConceptsData
1995.11	***November***	***1995***	Heads-Up and Feet-Down Digitizing — *discusses the design components of a GIS/GPS/RS field unit*	***B2, Topic 9, S3***	DataConsiderations_Input	Basic_ConceptsData
1995.09	***September***	***1995***	Put Things in Their Proper Places with GPS — *identifies the basic concepts, principles and theoretical underpinnings of the Global Positioning System (GPS)*	***B2, Topic 9, S1***	DataConsiderations_Input	Basic_ConceptsData
1995.08	***August***	***1995***	Rasterized Lines and Vectorized Cells — *describes specialized offshoots of traditional raster and vector data formats*	***B2, Topic 6, S4***	DataConsiderations_Structure	Basic_ConceptsData
1995.07	***July***	***1995***	How are your QUADS and TINS? — *describes alternative Quadtree and Triangular Irregular Network data formats*	***B2, Topic 6, S3***	DataConsiderations_Structure	Basic_ConceptsData
1995.06	***June***	***1995***	Raster is Faster, but Vector is Correcter — *describes the structuring of traditional Vector data using explicit topology linking spatial and attribute tables*	***B2, Topic 6, S2***	DataConsiderations_Structure	Basic_ConceptsData
1995.05	***May***	***1995***	Are You a GIS Dead Head? — *describes the structuring of traditional Raster data using implicit topology based on the row/column positioning in a matrix*	***B2, Topic 6, S1***	DataConsiderations_Structure	Basic_ConceptsData
1994.12	***December***	***1994***	Resolving Map Detail — *discusses the four basic types Map Resolution (Spatial, Minimum Mapping, Thematic, Temporal) that define the level of detail in a digital map as dramatically different from the traditional concept of Map Scale*	***B2, Topic 7, S3***	DataConsiderations_Accuracy	Basic_ConceptsData
1994.11	***November***	***1994***	What Does Your Computer Really Think of Your Map? — *discusses Spatial Topology through the differences among Graphics Packages, Mapping Software, Spatial Database Management Systems, and GIS Analysis/Modeling Systems*	***B2, Topic 7, S1***	DataConsiderations_Structure	Basic_ConceptsData
1993.09	***September***	***1993***	Terminology Accelerates Your Intellectual Depletion Allowance — *introduces the concepts and organization used in GIS*	***B1, Intro, S3***	DataConsiderations_Structure	Basic_ConceptsData

			databases comprised of multiple map layers			
1993.08	***August***	***1993***	GIS Maps Are Dumb *— compares the basic Vector and Raster data structure approaches for storing individual map layers*	***B1, Intro, S2***	DataConsiderations_Structure	Basic_ConceptsData
1993.07	***July***	***1993***	Coming to Terms with Terminology *— describes the underlying theory of how point, line and areal features are stored in Vector and Raster GISs*	***B1, Intro, S1***	DataConsiderations_Structure	Basic_ConceptsData
1993.03	***March***	***1993***	Effective Standards Required to Go Beyond Mapping *— identifies and describes four levels of GIS standards (data Exchange, Geographic, Algorithmic and Interpretational)*	***B1, Topic 10, S2***	DataConsiderations_Accuracy	Basic_ConceptsData
1989.07	***Jul****/Aug*	***1989***	GIS Technology Is Technical Oz *— discusses and compares the relative advantages/disadvantages between Vector and Raster processing*	***B1, Topic 1, S3***	DataConsiderations_Structure	Basic_ConceptsData
1989.05	***May*** *V2-3*	***1989***	It Depends: Implications of data structure *— discusses and compares the similarities and differences between Vector and Raster data structure applications*	***B1, Topic 1, S2***	DataConsiderations_Structure	Basic_ConceptsData
1989.03	***March*** *V2-2*	***1989***	Maps as Data: a 'Map-ematics' is Emerging *— describes the differences between Discrete and Continuous mapped data*	***B1, Topic 1, S1***	DataConsiderations_Structure	Basic_ConceptsData
2013.12	***December***	***2013***	Where Do We Go from Here? *— Swan Song after 25 years of Beyond Mapping columns*	***Epilog, S2***	Overview	**Basic_Discussion**
2013.11	***November***	***2013***	The Good, the Bad and the Ugly Sides of GIS *— discusses the potential of geotechnology to hinder (or even thwart) societal progress*	***Epilog, S1***	Overview	Basic_Discussion
2011.01	***January***	***2011***	Which Direction Are You Headed? *— describes four perspectives on the trailing "S" in the GIS acronym from a GIS'ers Perspective*	***B4, Topic 6, S1***	Education_Approaches	Basic_Discussion

2009.09	***September***	***2009***	GIS and the Cloud Computing Conundrum — *describes cloud computing with particular attention to its geotechnology expression*	***B4, Topic 10, S2***	Processing_Approaches	Basic_Discussion
2009.03	***March***	***2009***	What's in a Name — *suggests and defines the new more comprehensive term "Geotechnology"*	***B4, Intro, Further Reading2***	General_Overview	Basic_Discussion
2009.02	***February***	***2009***	Is it Soup Yet? — *describes the evolution in GIS definitions and terminology*	***B4, Intro, Further Reading1***	General_Overview	Basic_Discussion
2008.01	***January***	***2008***	Explore the Softer Side of GIS — *describes a Manual GIS (circa 1950) and the relationship between social science conceptual frameworks for understanding/judgment in GIS modeling*	***B4, Topic 5, Further Reading1***	General_Historical	Basic_Discussion
2007.12	***December***	***2007***	Lumpers and Splitters Propel GIS — *describes the two camps of GIS (GeoExploration and GeoScience)*	***B4, Topic 6, Further Reading1***	General_Overview	Basic_Discussion
2007.11	***November***	***2007***	Throwing the Baby Out with the Bath Water — *discusses the information lost in aggregating field data and assigning typical values to polygons (desktop mapping)*	***B4, Topic 4, S2***	SurfaceModeling_Interpolation	Basic_Discussion
2007.10	***October***	***2007***	Get a Consistent Statistical Picture — *describes creation of a Standardized Map Variable surface using Median and Quartile Range*	***B4, Topic 4, Further Reading1***	Map_Normalization	Basic_Discussion
2007.09	***September***	***2007***	Normally Things Aren't Normal — *discusses the appropriateness of using traditional "normal" and percentile statistics*	***B4, Topic 4, S3***	Map_Normalization	Basic_Discussion
2007.08	***August***	***2007***	GIS Innovation Drives Its Evolution — *discusses the cyclic nature of GIS innovation (Mapping, Structure and Analysis)*	***B4, Topic 10, S1***	General_Historical	Basic_Discussion
2007.01	***January***	***2007***	A Multifaceted GIS Community — *investigates the technical shifts and cultural impacts of the rapidly expanding GIS tent of users, application developers and tool programmers*	***B3, Epilog, S2***	General_Historical	Basic_Discussion

2006.12	***December***	***2006***	Pathways to GIS — *explores different paths of GIS adoption for five disciplines (Natural Resources, Facilities Management, Public Health, Business and Precision Agriculture)*	***B3, Epilog, S1***	General_Historical	Basic_Discussion
2006.11	***November***	***2006***	Contemporary GIS and Future Directions — *discusses contemporary GIS and probable future directions (Multimedia Mapping and Spatial Reasoning/Dialog)*	***B3, Intro, S2***	General_Historical	Basic_Discussion
2006.10	***October***	***2006***	Early GIS Technology and Its Expression — *traces the early phases of GIS technology (Computer Mapping, Spatial Database Management and Map Analysis/Modeling)*	***B3, Intro, S1***	General_Historical	Basic_Discussion
2005.08	***August***	***2005***	Taking Distance to the Edge — *discusses advance distance operations*	***B3, Topic 4, Further Reading3***	Distance_EffectiveProximity	Basic_Discussion
2004.03	***March***	***2004***	Use a Map-ematical Framework for GIS Modeling — *describes a conceptual structure for map analysis operations and GIS modeling*	***B3, Topic 3, S1***	ConceptualFramework_Operations	Basic_Discussion
2002.08	***August***	***2002***	Maps Are Numbers First, Pictures Later — *discusses the numeric and geographic characteristics of map values*	***B3, Topic 1, S2***	DataConsiderations_Accuracy	Basic_Discussion
1999.12	***December***	***1999***	Can Predictable Maps Work for You? — *describes a procedure for deriving a spatial prediction model*	***B3, Topic 10, Further Reading8***	SpatialDataMining_Regression	Basic_Discussion
1999.11	***November***	***1999***	Use Scatterplots to Understand Map Correlation — *discusses the underlying concepts in assessing correlation among maps*	***B3, Topic 10, Further Reading7***	SpatialDataMining_Regression	Basic_Discussion
1999.04	***April***	***1999***	GIS Represents Spatial Patterns and Relationships — *discusses the important differences among discrete mapping , continuous map surfaces and map analysis*	***B3, Topic 2, Further Reading1***	Processing_Approaches	Basic_Discussion
1999.03	***March***	***1999***	Observe the Evolving GIS Mindset — *illustrates the "map-ematical" approach to analyzing mapped data*	***B3, Epilog, Further Reading2***	Processing_Approaches	Basic_Discussion
1999.02	***February***	***1999***	Is GIS Technology Ahead of Science? —	***B3, Epilog, Further***	Processing_Approaches	Basic_Discussion

			discusses several issues surrounding the differences in the treatment of non-spatial and spatial data	***Reading1***		
1998.10	***October***	***1998***	GIS Data Are Rarely Normal — *describes the basic non-spatial descriptive statistics*	***B3, Topic 9, S1***	General_Overview	Basic_Discussion
1998.09	***September***	***1998***	GIS Software's Changing Roles — *discusses the evolution of GIS software and identifies important trends*	***B3, Intro, Further Reading1***	General_Historical	Basic_Discussion
1997.08	***August***	***1997***	Varied Applications Drive GIS Perspectives — *discusses how map analysis is enlarging the traditional view of mapping*	***B3, Epilog, Further Reading4***	ConceptualFramework_Modeling	Basic_Discussion
1996.11	***November***	***1996***	Does Anyone Object? — *discusses some concerns of object-oriented GIS*	***B3, Intro, Further Reading4***	General_Historical	Basic_Discussion
1996.10	***October***	***1996***	Spatial Objects—the Parse and Parcel of GIS? — *discusses database objects and their map expressions*	***B3, Intro, Further Reading3***	General_Historical	Basic_Discussion
1996.09	***September***	***1996***	What Is Object-Oriented Technology Anyway? — *establishes the basic concepts in object-oriented technology*	***B3, Intro, Further Reading2***	General_Historical	Basic_Discussion
1996.08	***August***	***1996***	Developing an Understanding GIS — *describes the translation of mapped data to spatial information for decision-making*	***B2, Epilog, S2***	General_Overview	Basic_Discussion
1996.07	***July***	***1996***	Don't Forget the Human Factor: an Experiential GIS — *describes an early experience (1980) in the application of GIS to land use planning involving the spatial expression and public hearing of a Comprehensive Plan of Development and Conservation*	***B2, Epilog, S1***	General_Historical	Basic_Discussion
1996.06	***June***	***1996***	Analyzing Spatial Dependency between Maps — *investigates multivariate analysis involving the coincidence of two or more map layers*	***B2, Topic 10, S3***	General_Overview	Basic_Discussion
1996.05	***May***	***1996***	Analyzing Spatial Dependency within a Map — *investigates univariate analysis involving spatial relationships within a single map layer*	***B2, Topic 10, S2***	General_Overview	Basic_Discussion
1996.04	***April***	***1996***	The Unique Character of Spatial Analysis	***B2, Topic 10,***	General_Overview	Basic_Discussion

			— discusses spatial analysis as deriving new spatial information based on geographic dependence within and among map variables	***S1***		
1995.04	***April***	***1995***	Explore a New Spatial Paradigm *— discusses the movement from mapping and spatial inventories by technologists to spatial reasoning and dialog involving enlightened users in development of solutions to complex spatial problems*	***B2, Intro, S2***	General_Overview	Basic_Discussion
1995.03	***March***	***1995***	Is the GIS Cart in Front of the Horse? *— discusses driving forces, trends and forecasts in contemporary GIS from the perspective of modeling interrelationships among mapped variables*	***B2, Intro, S1***	General_Overview	Basic_Discussion
1995.022	***February***	***1995***	Layers to Tapestry *(supplement) — describes an interactive environment for diagramming GIS Logic and processing flows*	***B2, Topic 5, S3***	ConceptualFramework_Modeling	Basic_Discussion
1995.01	***January***	***1995***	What's in a Model? *— discusses a conceptual framework for GIS model types and characteristics*	***B2, Topic 5, S1***	ConceptualFramework_Operations	Basic_Discussion
1994.06	***June***	***1994***	Build It and They Will Come *— describes the tactical and conceptual considerations in GIS implementation*	***B2, Topic 3, S3***	General_Overview	Basic_Discussion
1994.05	***May***	***1994***	What Can GIS Do for You? *— identifies and discusses the seven basic types of questions addressed by GIS technology*	***B2, Topic 3, S2***	General_Overview	Basic_Discussion
1994.04	***April***	***1994***	Question GIS before You Start *— discusses the importance of an Information Needs Assessment (INA) and a GIS Reality Assessment (GRA)*	***B2, Topic 3, S1***	General_Overview	Basic_Discussion
1993.12	***December***	***1993***	Consider a GIS Modeler's Toolkit *— discusses an Object-Oriented Programming System approach to GIS model development*	***B2, Topic 1, S3***	General_Historical	Basic_Discussion
1993.11	***November***	***1993***	Moving Toward a Humane GIS *— describes an interactive link between GIS model logic and code*	***B2, Topic 1, S2***	General_Overview	Basic_Discussion
1993.10	***October***	***1993***	Distinguishing Data from Information and	***B2, Topic 1,***	General_Overview	Basic_Discussion

			Understanding — *considers the fundamental concepts behind moving mapped data to information and ultimately to understanding*	***S1***		
1992.07	***July***	***1992***	Bringing the GIS Paradigm to Closure — *discusses the evolution and probable future of GIS technology*	***B1, Epilog, S1***	Future_Directions	Basic_Discussion
1992.06	***June***	***1992***	GIS Is Never Having to Say You're Sorry — *discusses the human and organizational considerations in adopting GIS technology*	***B1, Topic 8, S2***	General_Overview	Basic_Discussion
1992.05	***May***	***1992***	Both Dreams and Nightmares Are Born of Frustration — *discusses the limitations of traditional cost/benefit analysis in evaluating the adoption of a radically new technology like GIS*	***B1, Topic 8, S1***	General_Overview	Basic_Discussion
1991.06	***June***	***1991***	Frankly My Dear, I Don't Give a Damn — *discusses how GIS modeling and spatial reasoning are changing policy formation and decision-making*	***B1, Topic 4, S4***	General_Overview	Basic_Discussion
1991.05	***May***	***1991***	Who Says You Can't Teach an Old Dog New Tricks? — *describes the basic concepts and approaches used in GIS modeling*	***B1, Topic 4, S3***	General_Overview	Basic_Discussion
1991.04	***Apr****/Mar*	***1991***	What's Needed to Go Beyond Mapping — *lists and describes the analytical tools needed to go beyond mapping*	***B1, Topic 4, S2***	ConceptualFramework_Operations	Basic_Discussion
1991.02	***Feb****/Jan*	***1991***	Technobabble — *discusses the radical changes GIS technology and the digital map are bringing to traditional mapping*	***B1, Topic 4, S1***	General_Overview	Basic_Discussion
2008.11	***November***	***2008***	Discover the "Miracles" in Mapping Data Clusters — *describes the use of "clustering" to identify inherent groupings of similar data patterns*	***B4, Topic 7, S5***	SpatialDataMining_Clustering	**GeoBusiness_DataGrouping**
2008.10	***October***	***2008***	Get "Map-ematical" to Identify Data Zones — *describes the use of "level-slicing" for classifying locations with a specified data pattern*	***B4, Topic 7, Further Reading2***	SpatialDataMining_Classification	GeoBusiness_DataGrouping
2008.09	***September***	***2008***	Use Map Analysis to Characterize Data Groups — *describes the use of "data*	***B4, Topic 7, S4***	SpatialDataMining_Similarity	GeoBusiness_DataGrouping

			distance" to derive similarity among the data patterns in a set of map layers			
2008.06	***June***	***2008***	Linking Numeric and Geographic Distributions — *investigates the link between numeric and geographic distributions of mapped data*	***B4, Topic 7, S2***	SpatialDataMining_Clustering	GeoBusiness_DataGrouping
1998.04	***April***	***1998***	Continued Analysis of In-Store Movement and Sales Patterns — *describes the use of temporal analysis and coincidence mapping to enhance shopping patterns*	***B3, Topic 4, Further Reading14***	Distance_Routing	**GeoBusiness_InStoreMovement**
1998.03	***March***	***1998***	Further Analyzing In-Store Movement and Sales Patterns — *discusses how map analysis is used to investigate the relationship between shopper movement and sales*	***B3, Topic 4, Further Reading13***	Distance_Routing	GeoBusiness_InStoreMovement
1998.02	***February***	***1998***	GIS Analyzes In-Store Movement and Sales Patterns — *describes a procedure using accumulation surface analysis to infer shopper movement from cash register data*	***B3, Topic 4, Further Reading12***	Distance_Routing	GeoBusiness_InStoreMovement
2009.01	***January***	***2009***	Follow These Steps to Map Potential Sales — *describes an extensive geo-business application that combines retail competition analysis and product sales prediction*	***B4, Topic 7, Further Reading4***	Distance_TravelTime	**GeoBusiness_RetailMarketing**
2008.12	***December***	***2008***	Can We Really Map the Future? — *describes the use of "linear regression" to develop prediction equations relating dependent and independent map variables*	***B4, Topic 7, Further Reading3***	SpatialDataMining_Regression	GeoBusiness_RetailMarketing
2008.04	***April***	***2008***	Twisting the Perspective of Map Surfaces — *describes the character of spatial distributions through the generation of a customer density surface*	***B4, Topic 7, S1***	SurfaceModeling_DensityAnalysis	GeoBusiness_RetailMarketing
2002.06	***June***	***2002***	Use Travel Time to Connect with Customers — *describes techniques for optimal path and catchment analysis*	***B3, Topic 4, Further Reading11***	Distance_TravelTime	GeoBusiness_RetailMarketing
2002.05	***May***	***2002***	Grid-Based Mapping Identifies Customer Pockets and Territories — *identifies techniques for identifying unusually high*	***B3, Topic 6, Further Reading1***	SurfaceModeling_DensityAnalysis	GeoBusiness_RetailMarketing

			customer density and for delineating spatially balanced customer territories			
2002.04	***April***	***2002***	Maps and Curves Can Spatially Characterize Customer Loyalty — *describes a technique for characterizing customer sensitivity to travel-time*	***B3, Topic 4, Further Reading10***	Distance_TravelTime	GeoBusiness_RetailMarketing
2002.03	***March***	***2002***	Use Travel Time to Identify Competition Zones — *discusses the procedure for deriving relative travel-time advantage maps*	***B3, Topic 4, Further Reading9***	Distance_TravelTime	GeoBusiness_RetailMarketing
2008.08	***August***	***2008***	Interpreting Interpolation Results (and why it is important) — *describes the use of "residual analysis" for evaluating spatial interpolation performance*	***B4, Topic 7, Further Reading1***	SurfaceModeling_Interpolation	**GeoBusiness_SurfaceModeling**
2008.07	***July***	***2008***	Myriad Techniques Help to Interpolate Spatial Distributions — *discusses the basic concepts underlying spatial interpolation*	***B4, Topic 7, S3***	SurfaceModeling_Interpolation	GeoBusiness_SurfaceModeling
2001.03	***March***	***2001***	Integrate Travel-Time into Mapping Packages — *describes procedures for transferring travel-time data to other maps*	***B3, Topic 4, Further Reading5***	DataConsiderations_Structure	**GeoBusiness_TravelTime**
2001.02	***February***	***2001***	Use Travel-Time Buffers to Map Effective Proximity — *discusses procedures for establishing travel-time buffers responding to street type*	***B3, Topic 4, Further Reading4***	Distance_TravelTime	GeoBusiness_TravelTime
2012.06	***June***	***2012***	Questioning GIS in Higher Education — *describes thoughts and notes from a panel discussion on "GIS in Higher Education"*	***B4, Topic 6, Further Reading***	Generic	**GIS_Education**
2012.05	***May***	***2012***	Infusing Spatial Character into Statistics — *describes a statistical structure for spatial statistics operations*	***B4, Topic 9, S3***	ConceptualFramework_Operations	GIS_Education
2012.04	***April***	***2012***	Simultaneously Trivializing and Complicating GIS — *describes a mathematical structure for spatial analysis operations*	***B4, Topic 9, S2***	ConceptualFramework_Operations	GIS_Education
2012.03	***March***	***2012***	Paint by Numbers Outside the Traditional Statistics Box — *discusses the nature of Spatial Statistics operations*	***B4, Topic 9, Further Reading2***	ConceptualFramework_Operations	GIS_Education

2012.02	***February***	***2012***	Map-ematically Messing with Mapped Data — *discusses the nature of grid-based mapped data and Spatial Analysis operations*	***B4, Topic 9, Further Reading1***	ConceptualFramework_Operations	GIS_Education
2012.01	***January***	***2012***	SpatialSTEM Has Deep Mathematical Roots — *provides a conceptual framework for a map-ematical treatment of mapped data*	***B4, Topic 9, S1***	ConceptualFramework_Operations	GIS_Education
2010.03	***March***	***2010***	Fitting Square Pegs into Round GIS Educational Holes — *discusses the need to engage non-GIS students in developing spatially distributed solutions*	***B4, Topic 6, S4***	Education_Approaches	GIS_Education
2010.02	***February***	***2010***	GIS Education's Need for "Hitchhikers" — *establishes the need for engaging "domain experts" in moving geotechnology to the next level*	***B4, Topic 6, S3***	Education_Approaches	GIS_Education
2010.01	***January***	***2010***	A Quick Peek Outside GIS's Disciplinary Cave — *discusses future directions of geotechnology with particular emphasis on career outlook and GIS education*	***B4, Topic 6, S2***	Education_Approaches	GIS_Education
2003.05	***May***	***2003***	Turning GIS Education on Its Head — *describes the numerous GIS career pathways and the need to engage prospective students from a variety of fields*	***B3, Epilog, Further Reading6***	Education_Approaches	GIS_Education
1997.09	***September***	***1997***	Diverse Student Needs Must Drive GIS Education — *identifies new demands and students that are molding the future of GIS education*	***B3, Epilog, Further Reading5***	General_Overview	GIS_Education
1997.06	***June***	***1997***	Where Is GIS Education — *describes the broadening appeal of GIS and its impact on academic organization and infrastructure*	***B3, Epilog, Further Reading3***	General_Overview	GIS_Education
1993.06	***June***	***1993***	*Special URISA Issue — no BM column; special supplement made available, Learning Computer-Assisted Map Analysis — a 1986 journal article describing how "old-fashioned math and statistics can go a long way toward helping us understand GIS"*	***B1, Epilog, S2***	Education_Approaches	GIS_Education

1992.08	***August***	***1992***	A Tailored Plan and Curriculum Cure GIS Training Woes — *describes and discusses the importance of effective education and training needed for successful GIS adoption*	***B1, Topic 8, S3***	Education_Approaches	GIS_Education
2007.07	***July***	***2007***	The Long and Short of Slope — *investigates longitudinal and transverse slope calculation*	***B4, Topic 3, S2***	Neighborhood_Configuration	**Infrastructure_Pipeline**
2007.06	***June***	***2007***	Segmenting Our World — *discusses techniques for segmenting linear routes based on terrain inflection*	***B4, Topic 3, S1***	Overlay_CellbyCellCoincidence	Infrastructure_Pipeline
2004.02	***February***	***2004***	Migration Modeling Determines Spill Effect — *describes procedures for assessing overland and channel flow impacts*	***B3, Topic 4, Further Reading21***	Distance_EffectiveProximity	Infrastructure_Pipeline
2004.01	***January***	***2004***	Use Available Tools to Calculate Flow Time and Quantity — *discusses procedures for tracking flow time and quantity*	***B3, Topic 4, Further Reading20***	Distance_EffectiveProximity	Infrastructure_Pipeline
2003.12	***December***	***2003***	Constructing Realistic Downhill Flows Proves Difficult — *discusses procedures for characterizing path, sheet, horizontal and fill flows*	***B3, Topic 4, Further Reading19***	Distance_EffectiveProximity	Infrastructure_Pipeline
2003.11	***November***	***2003***	Traditional Approaches Can't Characterize Overland Flow — *describes the basic considerations in overland flow*	***B3, Topic 4, Further Reading18***	Distance_EffectiveProximity	Infrastructure_Pipeline
2009.08	***August***	***2009***	Use Spatial Sensitivity Analysis to Assess Model Response — *develops an approach for assessing the sensitivity of GIS models*	***B4, Topic 5, Further Reading2***	Distance_Routing	**Infrastructure_Routing**
2006.03	***March***	***2006***	Use LCP Procedures to Center Optimal Paths — *discusses a procedure for eliminating "zig-zags" in areas of minimal siting preference*	***B3, Topic 8, Further Reading2***	Distance_Routing	Infrastructure_Routing
2005.09	***September***	***2005***	Connect All the Dots to Find Optimal Paths — *describes a procedure for determining an optimal path network from a dispersed set of end points*	***B3, Topic 8, Further Reading3***	Distance_Connectivity	Infrastructure_Routing
2004.11	***November***	***2004***	'Straightening' Conversions Improve Optimal Paths — *discusses a procedure*	***B3, Topic 8, Further***	Overlay_CellbyCellCoincidence	Infrastructure_Routing

			for spatially responsive straightening of optimal paths	***Reading1***		
2013.01	***January***	***2013***	Optimal Path Density is not all that Dense (Conceptually) — *uses Optimal Path Density Analysis to identify "corridors of common access"*	***B4, Topic 8, Further Reading3***	Distance_Routing	**NaturalResources_EmergencyResponse**
2012.12	***December***	***2012***	Bringing Travel and Terrain Directions into Line — *describes comparison procedures and route evaluation techniques*	***B4, Topic 8, Further Reading2***	Distance_Routing	NaturalResources_EmergencyResponse
2012.11	***November***	***2012***	Just How Crooked Are Things? — *discusses distance-related metrics for assessing crookedness*	***B4, Topic 2, Further Reading1***	Distance_EffectiveProximity	NaturalResources_EmergencyResponse
2011.02	***February***	***2011***	Advancing the Concept of Effective Distance — *describes the algorithms used in implementing Starter value advanced techniques*	***B4, Topic 2, S1***	Distance_EffectiveProximity	NaturalResources_EmergencyResponse
2010.09	***September***	***2010***	Comparing Emergency Response Alternatives — *describes comparison procedures and route evaluation techniques*	***B4, Topic 8, S5***	Map_ComparisonDifference	NaturalResources_EmergencyResponse
2010.08	***August***	***2010***	Extending Emergency Response Beyond the Lines — *discusses basic model processing and modifications for additional considerations*	***B4, Topic 8, S4***	Distance_Routing	NaturalResources_EmergencyResponse
2010.07	***July***	***2010***	E911 for the Backcountry — *describes development of an on- and off-road travel-time surface for emergency response*	***B4, Topic 8, S3***	Distance_Routing	NaturalResources_EmergencyResponse
2010.06	***June***	***2010***	A Twelve-step Program for Recovery from Flaky Forest Formulations — *describes a spatial model for identifying Landings and Timbersheds*	***B4, Topic 8, Further Reading1***	Distance_EffectiveProximity	**NaturalResources_Harvesting**
2010.05	***May***	***2010***	Extending Forest Harvesting's Reach — *discusses a multiplicative weighting method for model extension*	***B4, Topic 8, S2***	Distance_EffectiveProximity	NaturalResources_Harvesting
2010.04	***April***	***2010***	Harvesting an Understanding of GIS Modeling — *describes a prototype model for assessing off-road access to forest areas*	***B4, Topic 8, S1***	Distance_EffectiveProximity	NaturalResources_Harvesting

2010.12	***December***	***2010***	GIS's Supporting Role in the Future of Natural Resources — *discusses the influence of human dimensions in natural resources and GIS technology's role*	***B4, Topic 8, S6***	Generic	**NaturalResources_Planning**
2009.07	***July***	***2009***	Melding the Minds of the "-ists" and "-ologists" — *elaborates on the two basic mindsets driving the geotechnology community*	***B4, Topic 6, Further Reading2***	Education_Approaches	NaturalResources_Planning
1999.08	***August***	***1999***	Use Metrics to Assess Forest Fragmentation — *describes some landscape indices for determining richness and fragmentation*	***B3, Topic 6, Further Reading12***	Reclassify_Shape	NaturalResources_Planning
1999.07	***July***	***1999***	Get to the Core of Landscape Analysis — *describes techniques for assessing core area and edge characterization*	***B3, Topic 6, Further Reading11***	Reclassify_Shape	NaturalResources_Planning
1999.06	***June***	***1999***	Use GIS to Analyze Landscape Structure — *discusses the underlying principles in landscape analysis and introduces some example landscape indices*	***B3, Topic 6, Further Reading10***	Reclassify_Shape	NaturalResources_Planning
1999.05	***May***	***1999***	Use GIS to Calculate Nearby Neighbor Statistics — *describes a technique that calculates the proximity to all of the surrounding parcels of a similar vegetation type*	***B3, Topic 6, Further Reading9***	Reclassify_Shape	NaturalResources_Planning
1996.02	***February***	***1996***	Evaluating Map-ematical Relationships — *discussed the differences and similarities between the two basic types of GIS models (Cartographic and Spatial) using the Revised Universal Soil Loss Equation (RUSLE) as an example*	***B2, Topic 8, S3***	Overlay_CellbyCellCoincidence	NaturalResources_Planning
1993.05	***May***	***1993***	Is Conflict Resolution an Oxymoron? — *discusses how weights are used combining individual map layers of concern to derive an overall map of suitability that reflects group consensus*	***B1, Topic 10, S4***	ConceptualFramework_Modeling	NaturalResources_Planning
1993.04	***April***	***1993***	Maps Speak Louder than Words — *describes analysis procedures that translate decision-maker concerns into maps*	***B1, Topic 10, S3***	ConceptualFramework_Modeling	NaturalResources_Planning
2010.11	***November***	***2010***	A Suitable Framework for GIS Modeling	***B4, Topic 5,***	ConceptualFramework_Modeling	**NaturalResources_Suitability**

			— describes a framework for suitability modeling based on a flowchart of model logic	***S5***		
2009.06	***June***	***2009***	A Narrow-minded Approach *— describes how Narrowness maps are derived*	***B4, Topic 2, S4***	Distance_Narrowness	NaturalResources_Suitability
2008.03	***March***	***2008***	Contiguity Ties Things Together *— describes an analytical approach for determining effective contiguity (clumped features)*	***B4, Topic 2, S3***	Reclassify_Contiguity	NaturalResources_Suitability
2004.10	***October***	***2004***	Logic and Extent Elevate Suitability Models to New Levels *— extends Rating discussion to include additional habitat considerations and model weighting*	***B3, Topic 7, S3***	Overlay_CellbyCellCoincidence	NaturalResources_Suitability
2004.08	***August***	***2004***	Mapping Techniques Rate Hugag Habitat Suitability *— expands discussion to Binary Progression and Rating suitability models*	***B3, Topic 7, S2***	Overlay_CellbyCellCoincidence	NaturalResources_Suitability
2004.07	***July***	***2004***	Suitability Models Find the Good, the Bad and the Hugag *— describes a simple suitability model for characterizing habitat*	***B3, Topic 7, S1***	Overlay_CellbyCellCoincidence	NaturalResources_Suitability
1996.01	***January***	***1996***	Extending Basic Models through Logic Modifications *— describes extensions to a simple Landslide Susceptible model by adding additional criteria that changes a model's structure*	***B2, Topic 8, S2***	ConceptualFramework_Modeling	NaturalResources_Suitability
1995.12	***December***	***1995***	From Recipes to Models *— describes basic Binary and Rating model expressions using a simple Landslide Susceptible model*	***B2, Topic 8, S1***	ConceptualFramework_Modeling	NaturalResources_Suitability
2011.09	***September***	***2011***	Assessing Wildfire Response (Part 2): *Jumping Right into It* *— describes map analysis procedures for determining initial response time for alternative attack modes*	***B4, Topic 8, Further Reading5***	Distance_EffectiveProximity	**NaturalResources_WildFire**
2011.08	***August***	***2011***	Assessing Wildfire Response (Part 1): *Oneth by Land, Twoeth by Air* *— discusses a spatial model for determining effective helicopter landing zones*	***B4, Topic 8, Further Reading4***	Distance_EffectiveProximity	NaturalResources_WildFire
2011.07	***July***	***2011***	Extending Information into No-Data Areas *— describes a technique for "filling-in"*	***B4, Topic 2, Further***	Neighborhood_Summary	NaturalResources_WildFire

			information from surrounding data into no-data locations	***Reading1***		
2006.02	***February***	***2006***	Nearby Things Are More Alike — *use of decay functions in weight-averaging surrounding conditions*	***B3, Topic 6, Further Reading2***	Neighborhood_Summary	NaturalResources_WildFire
2006.01	***January***	***2006***	Spatially Aggregated Reporting: The Probability is Good — *discusses techniques for smoothing "salt and pepper" results and deriving probability surfaces from aggregated incident records*	***B3, Topic 6, S3***	Neighborhood_Summary	NaturalResources_WildFire
2013.04	***April***	***2013***	Spatially Evaluating the T-test — *illustrates the expansion of traditional math/stat procedures to operate on map variables to spatially solve traditional non-spatial equations*	***B4, Topic 4, S5***	Map_ComparisonTtest	**PrecisionAgriculture_Analysis**
2006.09	***September***	***2006***	Statistically Compare Continuous Map Surfaces — *discusses procedures for comparing continuous map surfaces*	***B3, Topic 10, S2***	Map_ComparisonContinuousData	PrecisionAgriculture_Analysis
2002.09	***September***	***2002***	Normalizing Maps for Data Analysis — *describes map normalization and data exchange with other software packages*	***B3, Topic 1, S3***	Map_Normalization	PrecisionAgriculture_Analysis
2002.02	***February***	***2002***	Stratify Maps to Make Better Predictions — *illustrates a procedure for subdividing an area into smaller more homogenous groups prior to generating prediction equations*	***B3, Topic 10, Further Reading10***	SpatialDataMining_Regression	PrecisionAgriculture_Analysis
2002.01	***January***	***2002***	Spatial Data Mining Allows Users to Predict Maps — *describes the basic concepts and procedures for deriving equations that can be used to derive prediction maps*	***B3, Topic 10, Further Reading9***	SpatialDataMining_Regression	PrecisionAgriculture_Analysis
2001.12	***December***	***2001***	Use Statistics to Map Data Clusters — *discusses clustering for partitioning an area into separate data groups*	***B3, Topic 10, S5***	SpatialDataMining_Clustering	PrecisionAgriculture_Analysis
2001.11	***November***	***2001***	Use Similarity to Identify Data Zones — *describes level-slicing for classifying areas into zones containing a specified data pattern*	***B3, Topic 10, S4***	SpatialDataMining_Classification	PrecisionAgriculture_Analysis
2001.10	***October***	***2001***	Geographic Software Removes	***B3, Topic 10,***	SpatialDataMining_Similarity	PrecisionAgriculture_Analysis

			Guesswork from Map Similarity — *discusses basic considerations and procedures for generating similarity maps*	***S3***		
2006.08	***August***	***2006***	Spatial Data Mining "Down on the Farm" — *discusses process for moving from Whole-Field to Site-Specific management*	***B3, Topic 10, S6***	General_Overview	**PrecisionAgriculture_Process**
1998.08	***August***	***1998***	Identify Data Patterns — *discusses data clustering and its application in identifying spatial patterns*	***B3, Topic 10, Further Reading4***	SpatialDataMining_Clustering	**SpatialDataMining_Clustering**
2013.08	***August***	***2013***	Generating Mountains and Molehills from Field Sampled Data — *creating an elevation surface from field sampled data*	***B4, Topic 3, S4***	SurfaceModeling_Interpolation	**Terrain_Analysis**
2012.08	***August***	***2012***	Altering Our Spatial Perspective through Dynamic Windows — *discusses the three types of roving windows— fixed, weighted and dynamic*	***B4, Topic 3, S5***	Neighborhood_Configuration	Terrain_Analysis
2009.05	***May***	***2009***	Identifying Upland Ridges — *describes a procedure for locating extended upland ridges*	***B4, Topic 3, S3***	Distance_Connectivity	Terrain_Analysis
2008.05	***May***	***2008***	Shedding Light on Terrain Analysis — *discusses how terrain orientation is used to generate Hillshade maps*	***B4, Topic 3, Further Reading1***	Neighborhood_Configuration	Terrain_Analysis
2005.10	***October***	***2005***	Computer Processing Aids Spatial Neighborhood Analysis — *discusses approaches for calculating slope and profile*	***B3, Topic 6, S1***	Neighborhood_Configuration	Terrain_Analysis
2002.11	***November***	***2002***	Identify Valley Bottoms in Mountainous Terrain — *illustrates a technique for identifying flat areas connected to streams*	***B3, Topic 4, Further Reading17***	Neighborhood_Configuration	Terrain_Analysis
2000.05	***May***	***2000***	Modeling Erosion and Sediment Loading — *illustrates a GIS model for assessing erosion potential and sediment loading*	***B3, Topic 4, Further Reading16***	Distance_EffectiveProximity	Terrain_Analysis
2000.04	***April***	***2000***	Confluence Maps Further Characterize Micro-terrain Features — *describes the use of optimal path density analysis for mapping surface flows*	***B3, Topic 4, Further Reading15***	Distance_Connectivity	Terrain_Analysis
2000.03	***March***	***2000***	Characterizing Terrain Slope and	***B3, Topic 6, Further***	Neighborhood_Configuration	Terrain_Analysis

			Roughness — *discusses techniques for determining terrain inclination and coarseness*	***Reading6***		
2000.02	***February***	***2000***	Characterizing Local Terrain Conditions — *discusses the use of "roving windows" to distinguish localized variations*	***B3, Topic 6, Further Reading5***	Neighborhood_Summary	Terrain_Analysis
2000.01	***January***	***2000***	Use Data to Characterize Micro-Terrain Features — *describes techniques to identify convex and concave features*	***B3, Topic 6, Further Reading4***	Neighborhood_Summary	Terrain_Analysis
2013.07	***July***	***2013***	In Search of the Elusive Image — *describes extended geo-query techniques for accessing images containing a location of interest*	***B4, Topic 2, Further Reading3***	Distance_Operations	**Video_Mapping**
2000.10	***October***	***2000***	Video Mapping Brings Maps to Life — *describes how video maps are generated and discusses some applications of video mapping*	***B3, Intro, Further Reading9***	General_Overview	Video_Mapping
2000.09	***September***	***2000***	Capture "Where and When" on Video-based GIS — *describes how GPS-enabled video and digital still cameras work*	***B3, Intro, Further Reading8***	General_Overview	Video_Mapping
2000.08	***August***	***2000***	How to Represent Changes in a Virtual Forest — *discusses how simulations and "fly-bys" are used to visualize landscape changes and characteristics*	***B3, Intro, Further Reading7***	General_Overview	**VirtualReality_Mapping**
2000.07	***July***	***2000***	How to Rapidly Construct a Virtual Scene — *describes the procedures in generating a virtual scene from landscape inventory data*	***B3, Intro, Further Reading6***	General_Overview	VirtualReality_Mapping
2000.06	***June***	***2000***	Behind the Scenes of Virtual Reality — *discusses the basic considerations and concepts in 3D-object rendering*	***B3, Intro, Further Reading5***	General_Overview	VirtualReality_Mapping

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