

# GIS and Multi-Criteria Decision Making to Determine Marketability of Pay Pond Businesses in West Virginia

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## Introduction

The purpose of this study was to perform spatial multi-criteria analysis in order to rank and display marketability of thirty-two pay pond businesses in West Virginia. This study is not intended to be a comprehensive analysis of all factors that influence marketability. The analysis is limited to criteria that have spatial reference. Furthermore, criteria analysis for a pay pond businesses' marketability rank is limited by scope of the spatial data. Spatial data was obtained for West Virginia only and not adjacent states.



Pa Jim's Pay Pond in Eleanor, WV opened for business in 2003.



Pay pond anglers land a catfish at Family Fishing and Camping in Wendel, WV.

## Method

**GIS Applications** GIS, geographic information systems, is a powerful and sophisticated tool for displaying and analyzing spatial relationships between geographic phenomena in the form of vectors and images. GIS is a useful tool in natural resource recreation studies because of its ability to perform analysis of spatial overlay. The process of spatial overlay is simply the layering of two maps so that data can be analyzed. For instance, the distance between two geographic features (e.g., a pay pond and population center, or a pay pond and another pay pond) can be calculated using GIS.

**Multi-Criteria Decision Making** Multi-criteria decision making, combined with GIS data, is a powerful approach to systematically and comprehensively analyze a problem. Fundamental components of a multi-criteria problem are human value judgment, tradeoff evaluations, and assessments of the importance of criteria. Nonetheless, criteria that have GIS capabilities can be used to achieve a desired objective.

**Selection of Criteria** GIS requires that the evaluation criteria have a spatial reference. Within this parameter, a pay pond's distance to population centers, distance to major roads, and distance to interchangeable competition (i.e., other pay pond and public fishing locations) are criteria that influence marketability. For each evaluation criterion, an appropriate spatial data layer was selected for the analysis (Table 1).

**Table 1.** Spatial Data Information for Evaluation

Criterion/Criteria	Spatial Data Layer	Type	Source	Scale
Distance to population centers	Cities with population greater than 2,500	Point shapefile	WV State GIS Technical Center	1: 100,000
Distance to major roads	U.S. routes	Compressed ESRI polyline shapefile	WV State GIS Technical Center	1: 100,000
Distance to competition	WV pay pond businesses	Point shapefile	Aurora Moldovanyi	1: 24,000
Distance to competition	Public fishing areas	Compressed ESRI polygon shapefile	WV State GIS Technical Center	1: 100,000

**Evaluation of Criteria** Spatial data were overlaid, and then queried using the Buffer Wizard and the straight line distance function of the Spatial Analyst within GIS to obtain values for evaluation criteria. Raw data were standardized to comparable units using the Field Calculator and combined to create an index of marketability for each pay pond business. Each business was assigned a rank (i.e. lowest, fair, moderate, good, highest) based on natural breaks in index scores.

## Results

The index scores were affected by these basic assumptions for the evaluation criteria:

- \* The greater the number of population centers within 23 miles of the pay pond business, the greater its marketability (23 miles is the qualifying distance because it is the median distance West Virginia pay pond anglers traveled to fish at a pay pond in 2002);
- \* The closer the pay pond business is to a major road, the greater its marketability;
- \* The closer the pay pond business is to interchangeable competition, the lower its marketability;

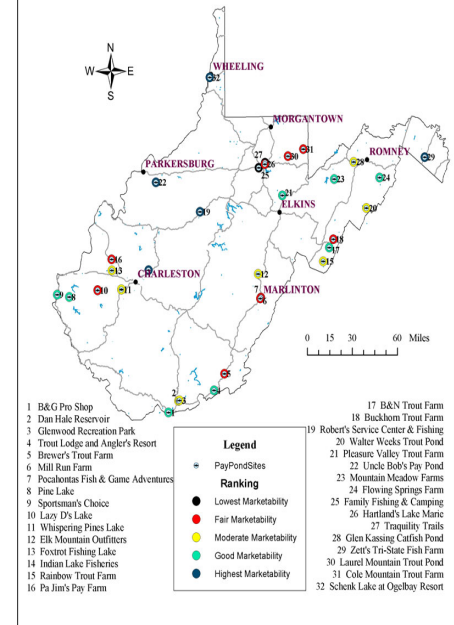
As a result, pay pond businesses had a wide distribution of results based on these assumptions. Two businesses had index scores between -204 and -175; they received the lowest marketability rank. Nine received index scores between -159 and -132; they received a fair marketability rank. Eight were between -120 and -101; they received a moderate rank. Eight were between -79 and -44; they received a good rank. And, five pay pond businesses had index scores between -17 and +26; they received the highest marketability rank.

Table 2 shows the index of marketability, as well as the raw scores for the criteria that were used to arrive at the index. Figure 1 shows the associated marketability rank for each pay pond business.

**Table 2.** Raw Data Scores and Standardized

Index Pay Pond Business	# of population centers within 23 miles	# of pay ponds within 10 miles	# of pay ponds within 20 miles	# of pay ponds within 30 miles	# of miles to the nearest major road	# of miles to nearest public area	Standardized Multi-Criteria Index
B&G Pro Shop	13	1	2	3	5	5	-44
Dan Hale Reservoir	15	1	2	3	5	5	-104
Glenwood Recreation Park	15	1	2	3	5	5	-104
Trout Lodge and Anglers Resort	6	0	1	3	10	10	-69
Brewer's Trout Farm	8	1	1	2	5	5	-152
Mill Run Farm	3	1	2	2	5	5	-140
Pocahontas Fish & Game Adventures	3	1	2	2	5	10	-140
Pine Lake	11	1	2	2	10	5	-66
Sportman's Choice	8	1	1	2	5	5	-77
Lazy DS Lake	25	0	4	5	5	10	-159
Whispering Pines Lake	30	0	3	4	5	10	-101
Elk Mountain Outfitters	5	0	2	2	5	10	-175
Foxrest Fishing Lake	23	1	2	2	10	5	-66
Indian Lake Fisheries	25	0	0	4	10	5	-117
Mountain Trout Farm	1	1	2	2	5	5	-150
Pa Jim's Pay Pond	24	1	3	4	5	10	-52
BN Trout Farm	1	2	2	2	20	5	-79
Buckhorn Trout Farm	2	0	0	0	10	10	-138
Robert's Service Center & Fishing Hole	11	0	0	0	20	5	-114
Walker Weeks Trout Pond	3	0	1	4	20	5	-150
Pleasure Valley Trout Farm	19	0	0	0	20	5	-65
Uncle Bob's Pay Pond	16	0	0	0	20	10	-2
Mountain Meadow Farms	8	0	1	3	20	5	-79
Flowing Springs Farm	5	0	2	2	10	5	-252
Family Fishing & Camping	10	3	2	4	5	5	-204
Hartland's Lake Maric	36	3	4	2	10	5	-156
Tranquility Trails	38	3	3	5	10	5	-175
Elk Kassing Catfish Pond	7	0	2	3	5	10	-26
Elk Kassing Fish Farm & Hatchery	10	0	0	0	5	5	-132
Fauser's Mountain Trout Pond	26	0	3	5	5	10	-132
Cole Mountain Trout Farm	16	0	0	0	5	10	-138
Schenk Lake at Ogeboe Resort	16	0	0	0	5	10	-117

**Figure 1.** Marketability Ranking of West Virginia Pay Pond Businesses



## Discussion

The use of GIS and a multi-criteria decision making model to examine marketability shows that a great deal of variability exists between the thirty two pay pond businesses in West Virginia.

Pay pond businesses should take advantage of their proximity to nearby population centers and major roads, as a means of advertising and promoting their business. Strategic marketing agendas that focus on these areas could increase local angler and tourist recruitment. More specifically, collaboration and advertisement with local tourism boards, the West Virginia Division of Tourism, and other travel, tourism, and recreation-related industries could also increase angler recruitment.

In addition, pay pond businesses that are in close proximity to competition could increase demand for their business by offering a unique experience (i.e. a tournament) or setting (i.e. family friendly). They should consider diversifying their "product" by offering a variety of fish species, services, or facilities that anglers desire. To better understand how to recruit first-time and repetitive pay pond anglers, pay pond businesses should continue to work with the WV Aquaculture Extension and the WVU Recreation, Parks, and Tourism Program.