

Bald Eagle Habitat Model:  
A comprehensive study of suitable habitat between the years 1978 and 1992  
Barry County, Michigan

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Abstract:

This essay is a comprehensive study of suitable habitat for Bald Eagles in Barry County, Michigan, between the years 1978 and 1992. The study parameters include suitable land cover, hydrology, roads, and city data. A systematic and statistical comparison was performed between the two years to evaluate change in land use for the purpose of protection, conservation, and future areas of restoration projects. Though this habitat model is based on Bald Eagles it is not purely limited to them; this study, including all parameters, can pertain to other numerous reclusive species, which may also reside in the area.

Since the beginning of experimentation we, as human researchers, have tried to explain the complexities of life. These complexities are numerous, which makes for broad study and comprehension tremendously difficult. In most cases it is impossible to understand every aspect of an area of study. As our studies furthered and time progressed we found that natural and ecological connections bind our way of life, and the structure of our earth. All things are connected and affected by outside phenomenon; this can include all living and non-living things on earth. This interconnectedness demonstrated the vastness of the universe, and our dependence on everything within. Additionally, later scholars began to realize that the world we live in is far too broad to understand and account for everything. With that said, researchers saw the need for the implementation of what is commonly known as 'the model'. It is here we can describe a phenomenon in more simple terms, and also interact with said phenomenon under very controlled and very precise procedures. This simplification of the world we live in is not an exact measurement, but if done correctly with adequate input and understanding of the phenomenon it can be very representative of the truth.

Models in general can be applied to nearly every area of study. Most notably they are frequently applied to economics, marketing, real estate, physics, chemistry, etc. As time passes the importance of modeling has only increased. We can use models to project future markets, to see how products appeal to consumers, where areas may become future market places, and even how a scientific experiment may play-out. The implication of the findings while utilizing a model may be tremendous. By monitoring trends and changes in a given area we can prepare for future changes and even modify them to meet our own goals and requirements. Once we have a good grasp on the entity we are modeling, pertaining to its current and future status, we can plan for anything, and anticipate changes and alterations. Modeling can and does improve our lives daily. Currently, nearly everything we do or are involved with has been subject to a model. This ranges from the traffic lights we drive through, to the food we eat, to the communities we live in.

Recently, a new type of modeling has taken a very forefront position. This type of modeling is called 'habitat-modeling'. Though this is not a new practice, the modeling manner in which I will go into depth is relatively new. Early biologists and ecologists used habitat modeling at its most basic level; there was not adequate data collection methods and storage. In the present day, biologists and ecologists have better methods of data collection, storage, and manipulation. Though during both times data collections were stored in databases, spreadsheets, etc, now we have the option of storing our information in computer databases. By doing this we have increased the amount of information we can study and also reduce the amount of time it takes to record and process the data. Rather than numerous filing cabinets packed with observation sheet after observation sheet we now can store the same amount of data or more in something the size of a notebook computer. Data storage techniques have revolutionized our ways of data collection and storage. Additionally, the implementation of the computer has allowed for better data management. Most importantly, with the addition of the computer to our research we can now also examine the spatial aspect of an area.

The model that I will evaluate and present to you here is one involving habitat modeling for Bald Eagles within Barry County, Michigan. A Bald Eagle habitat model is tremendously important, since as of recent times their numbers have been increasing. This includes increased birthrate and also increased survivability. Much of this is attributable to increased understanding of habitat requirements and also understanding of habitat destruction and restoration.

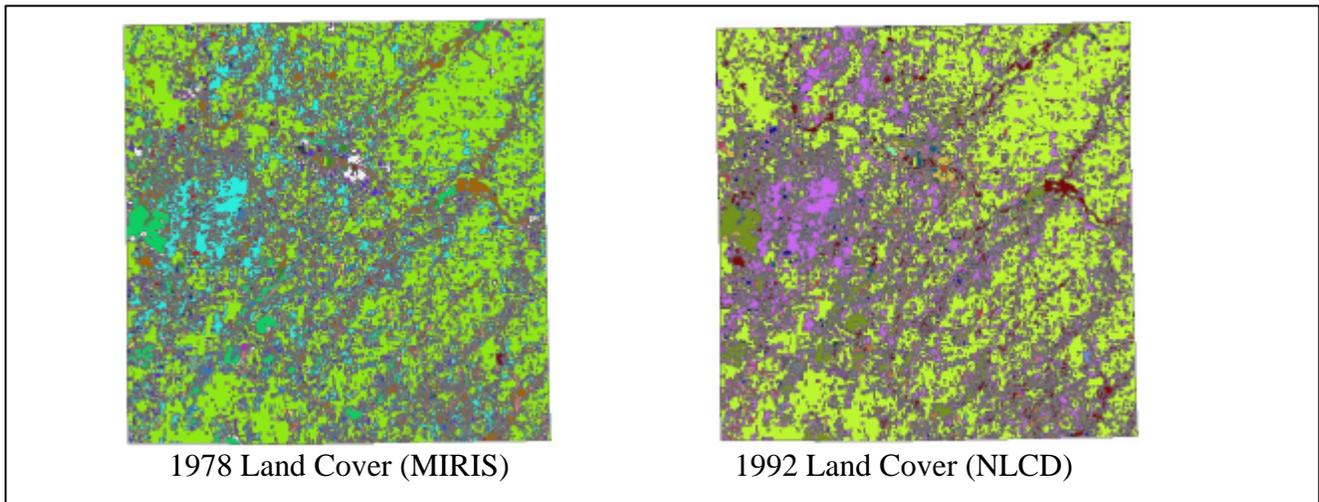
The first turn around for these illusive predatory birds was the discovery of the negative effects of DDT usage within the environment. Author Rachel Carson was the whistle blower for this movement with the presentation of her findings in the book title Silent Spring. Though not limited to Bald Eagles alone, birds would accumulate DDT and its other constituents within their fatty tissues through bioaccumulation, which later resulted in reproduction problems. DDT had a tendency to alter the egg structure in all birds, making newly laid eggs either extremely fragile or completely shell less, both resulting in very little net birth rates. As Carson grew in popularity so did the movement toward a society

without DDT. Eventually DDT was banned as a pesticide with other organic, less harmful pesticides taking its place. Slowly but surely the Bald Eagles could recover. (R. Carson, 'Silent Spring')

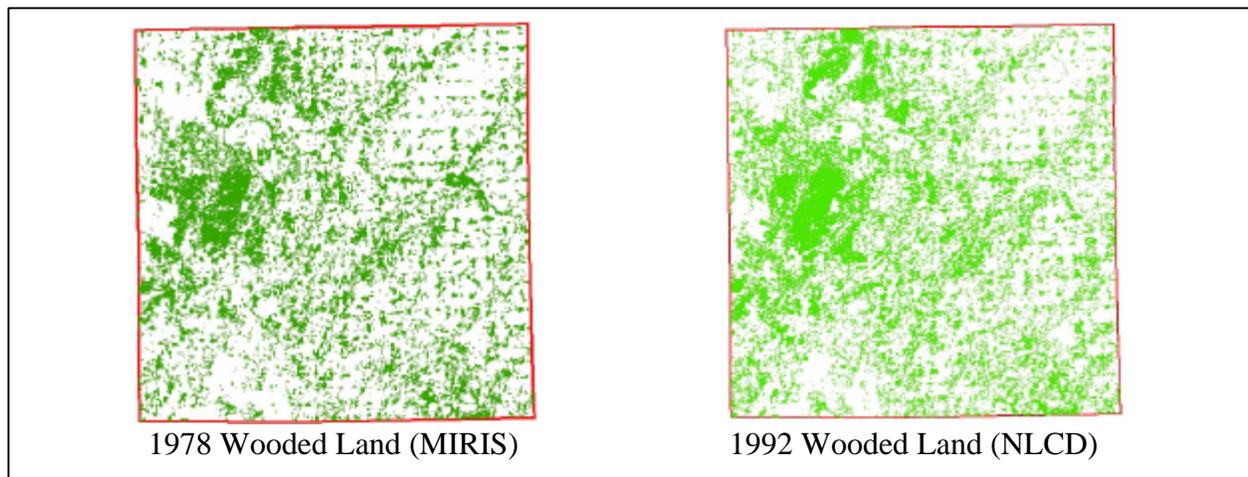
Bald Eagle' dwindling numbers are not only attributed to pesticide use, they are also in danger due to commercialization and urbanization. This expansion of human relationships into the wilderness began to cause much habitat fragmentation. This intrusive behavior can cause stress, as they are a quiet, solitary species. Regardless, these birds continued to recover and move further into isolation, abandoning nests in areas of higher traffic. As we continue to urbanize and commercialize I found providing a habitat model for these bald eagle to be tremendously important. By evaluating all of their needs in depth one can create a relatively accurate model of both habitat and possible suitable future habitat. I entered this project with a scope of presenting the most accurate output dataset, by approaching it with both a pessimistic and optimistic view of potential habitat. It is important to understand that these rare airborne predators prefer to be away from the public eye and thus I likely overly interpreted their solitary needs in hopes of a more accurate end dataset, with room to move outward, if need be.

While viewing this project one may question why my chosen area of study was Barry County, Michigan. This can easily be explained with a little background. In the fall of 2003 my father, Mark Pengra, spotted a Bald Eagle eating carrion in a field in front of his house. This field is located in southeast Barry County, between Battle Creek and Bellevue, and is approximately 25 miles south of Hastings. Not only did my father view this phenomenon once, he observed this Bald Eagle numerous times. This led me to question the residence of Bald Eagles in Barry County. Though I understand eagles travel tremendous distances, I found it unlikely that one would return to this particular field numerous times unless it resided somewhat closely. It was at this point I began to examine the natural requirements of Bald Eagles in respect to natural vegetation and seclusion. Though these requirements are characteristic of many solitary animals and are not purely limited to Bald Eagles, in this model I will focus on them.

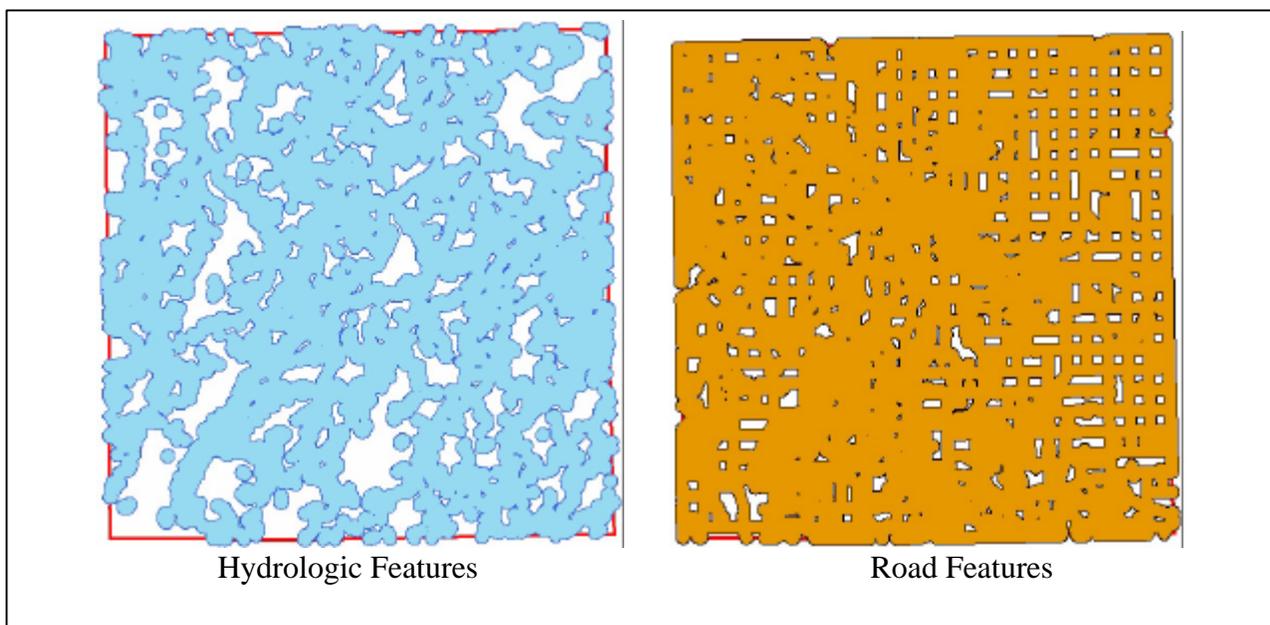
The model in which I present utilized the National Land Cover Dataset for 1992, the MIRIS Land Cover Dataset for 1978, and all road and hydrologic features within Barry County. Upon beginning this project my scope was to perform a comprehensive comparison between suitable habitat in 1978 and 1992. This comparison is tremendously important to evaluate both loss of habitat and habitat fragmentation.



For both land cover datasets I queried for all wooded land cover types (Central Hardwoods and Conifers), these made up a rather extensive forest cover dataset. At this point I felt very optimistic about available nesting habitat locations, as a good fraction of Barry County was occupied with forestland cover in both time frames. A wooded landscape is vital to Eagles in this area, as they use relatively high vantage points for hunting and also as a defense mechanism.

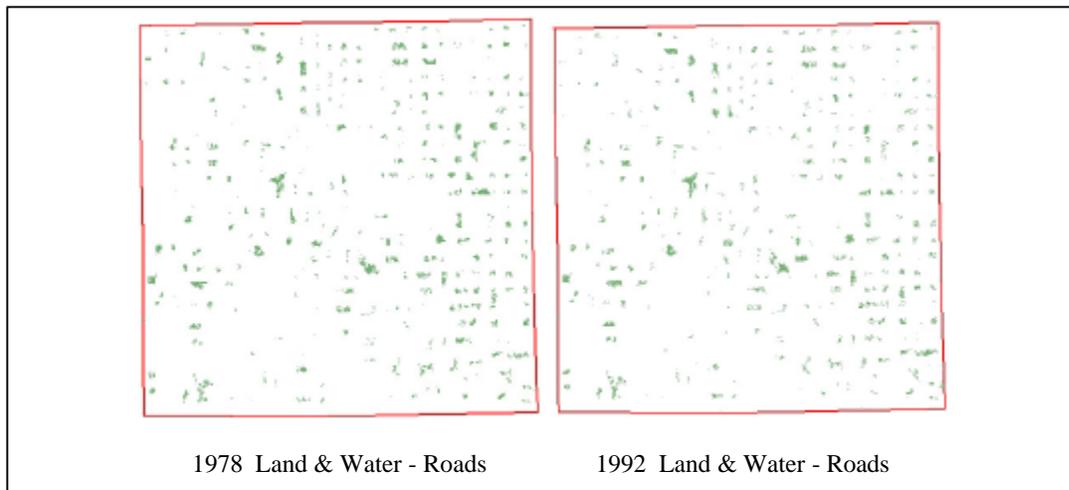


My next step was to buffer the road and hydrologic features; both datasets received a generous 500-meters buffer. I deliberately created large buffers to gain a better perspective of specific target areas in the end dataset. The road data buffer is tremendously important; as I stated earlier, Bald Eagles are quite reclusive and will not typically reside in extreme proximity of the roads. Many may argue this, especially in Michigan, as a major reason for premature death in Bald Eagles is via vehicle collision. Eagles in general have developed a terrible habit of eating road kill, only to be struck by on coming vehicles. Regardless of this scavenging I still ascertain my 500-meter buffer away from roads. The hydrologic feature buffer is also of great importance. Eagles typically occupy areas in near proximity of water bodies, for their fish consumption other various hydrologic needs. Thus, I have instituted a 500-meter buffer in which they must reside.

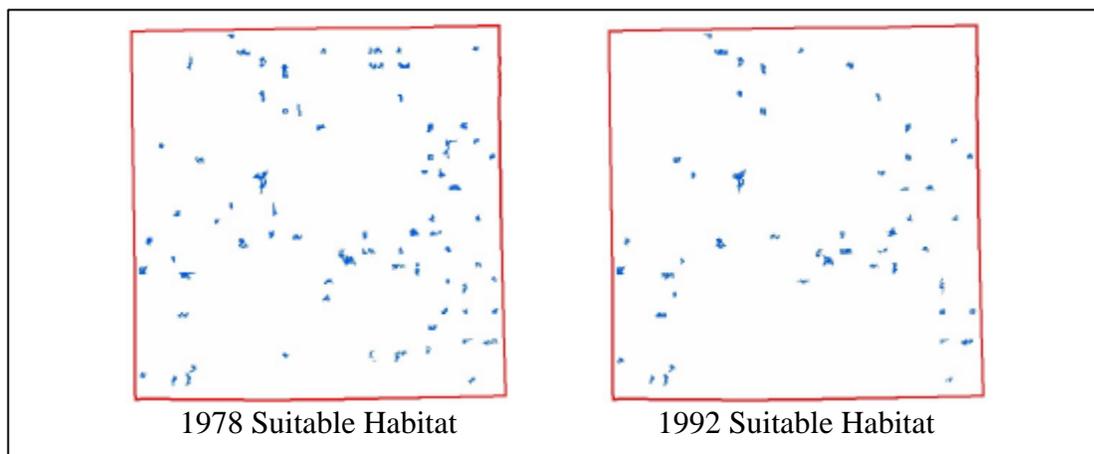


The next and most important step was to see how these layers fit together. My first priority was to intersect the wooded land cover data set with that of hydrologic feature. Once accomplished this would be an estimated suitable area without regard to our social interactions (i.e. Roads). Upon completion I began to see that my dataset began to get much smaller; I knew at this point the habitat model in both time frames would yield only a small percentage of the entire county input. Nonetheless I pushed forward, it

was at this point that I erased the road data from the wooded water intersection. Amazingly there were very few extremely large polygons. Finally I also decided to give the city of Hastings its own 3000-meter buffer and erase its polygon from the suitable area. Its outcome was very interesting; there were many small suitable areas and only a handful of larger ones.



The more I thought about this experiment the more I began to think about how these suitable habitats were like islands. They are very similar to an extensive network of islands surrounded by a sea, a treacherous sea. This led me to think, if I were stranded on an island I would want the largest; it would yield the most natural resources (we would hope). After this premonition I decided that many of these very small suitable areas (<.25acres) were really not suitable, so I created a query, which required any suitable land to be greater than 40 acres. This changed the habitat model a great deal, for example in 1978 from 1106 polygons to 76 suitable polygons. This reduction made for better target areas of study and analysis.



The end data for the two years yielded 76 suitable areas in 1978 and 49 suitable areas in 1992. In 1978 these 76 areas occupied an area of 5851 acres, with the average area occupying 76.98 acres. In 1992 these 49 areas occupied an area of 3732.7 acres, with the average area occupying 76.17 acres. Upon comparison of the habitat model between the years an interesting trend presented itself. Between the two years there was a reduction of 35.53% in total number of areas and a 36.2% reduction in total acreage. The data also shows an average loss of 1.93 areas/year and 176.53 acres/year. These findings are shocking; it is horrifying to see such a dramatic decrease in number of areas and total acreage in a mere 14-year period. Additionally I will comment on the age of this data, as of this year, 2004, we have passed another 14-year period, which means that the 1992 National Land Cover Data is precisely in between the years 1978 and 2004. Thus by no means is this dataset extremely current in its presentation. However, this 1992 land cover data was useful in that it backed the habitat model with the use of a statistical trend to evaluate change. Ideally a more recent dataset (i.e. >2000) would prove to be useful, and once it is available I will use it to monitor continued change in habitat area.

While evaluating possible implications of these findings I have decided that it is possible for Bald Eagles to reside within Barry County. However, I believe this may only be a temporary option. If we continue our trend of commercialization and urbanization there will be no chance of future inhabitation of Bald Eagles or any solitary species in general. Continued fragmentation of our landscape will make for increased numbers of animal human interactions, which in turn typically results in a reduction of animal numbers. This is a game of balance and precision, which we are the only ones who can initiate or implement change. Possible changes may include habitat restoration and or creation of refuges. It is my firm hope that something will be done to control this chaotic cycle, and protect our wildlife. Sadly it is my fear that little will be done to protect the wilderness and wildlife in this area and great deal of them will be forced to smaller and smaller areas until they perish, due of stresses and human interaction. Regardless, I will remain hopeful and optimistic that we will eventually see our misguided ways and work to restore the environment with an emphasis on conservation and preservation.

Sources:

Carson, R. Silent Spring. Houghton Mifflin Co. 2002.

Michigan Spatial Data Library. <http://www.mich.gov/cgi>. Land Cover, Hydrology, Roads for BarryCounty.