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THE NEW GOPHER TORTOISE PERMITTING GUIDELINES

By Arthur "Art" D. Wade III, PWS

The Florida Fish and Wildlife Conservation Commission (FWC) classifies the gopher tortoise (*Gopherus polyphemus*) as a threatened species under Chapter 68A-27.004 F.A.C. In general, the rule states that no person shall take, pursue, harass, or capture a gopher tortoise, its eggs, or damage the burrows unless authorized by the FWC. To help provide additional protection for the gopher tortoise, the FWC approved the *Gopher Tortoise Permitting Guidelines* (Guidelines) on April 9, 2008. The Guidelines address numerous topics such as determining if an activity requires a permit, the types of permits available and how to obtain them, burrow survey requirements, and the capture and relocation of tortoises. A thorough review of the Guidelines is beyond the scope of this article; therefore, discussion will be limited to a few of the items which are believed to affect most landowners and developers. At the time this article was written, the date of implementation of the Guidelines was unknown. However, based on a review of the FWC website and discussion with FWC staff, it appears many of the changes will be implemented in the spring of 2009.

What Are Gopher Tortoises?

Gopher tortoises are docile, land-dwelling turtles that eat a variety of grasses and flowering plants. They live in underground burrows which they construct by digging with their front feet, and often share their homes with many different animal species (also known as commensal species), such as the eastern indigo and Florida pine snakes, Florida mouse, and the Florida gopher frog.

Gopher tortoises are found throughout almost all of Florida's counties, the southern portions of Georgia, Alabama, and Mississippi, and a few counties in southern South Carolina . While gopher tortoises generally prefer to construct their burrows in dry, sandier areas, they are not limited to these locations, and burrows have even been observed in the wetter soils of pine flatwoods. Dry, sandy areas are not only valuable to gopher tortoises, but also to humans….and for many of the same reasons: good soils, good drainage, and good location. The competition for such prime real estate has led to the loss of tortoise habitat and a significant decrease in the tortoise population, as well as the decline of commensal species.

What Activities Require A Permit?

Permits are required for any activity that causes harm or destruction to tortoises and their burrows. Examples of these activities include:

- Collapsing, blocking, or covering tortoise burrows, or filling the burrows with harmful substances
- Excluding tortoises from their burrows
- Altering tortoise habitat to an extent that tortoises can not survive
- Site preparation for development activities that results in tortoises or their burrows being impacted

What Activities Do Not Require A Permit?

Some activities are authorized even if they do impact tortoises or their burrows. However, these cases are specific and must be conducted in accordance with the Guidelines. The activities are as follows:

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EOHS NEWS

- *OSHA - Florida's construction and retail industries are virtually tied as leading business sectors for Workers' compensation claims involving lost-time injuries in 2007*
- *US Public Health Services - "ErgoFed Assessment" tool available and is an innovative, useful approach to identifying office ergonomic issues that effect employees comfort and performance and may result in musculoskeletal injuries according to the Federal Occupational Health Department. For more information please visit www.foh.dhhs.gov/default.asp.*
- *US District Court - Contractors cleaning up mold have no separate duty to notify employees working in the building to properly perform the cleanup work.*

Inside this issue:

ERGONOMICS IN THE WORKPLACE

By Beth S. Blackmon, MSPH

Over the past decade, changes in regulations pertaining to ergonomics have been implemented, but there are still a broad range of requirements that can be both challenging and confusing for businesses to meet. For example, in March 2001, President George W. Bush signed Senate Joint Resolution 6, which rescinded the original Ergonomic Rule passed under the Clinton administration and prohibited the Occupational Safety and Health Administration (OSHA) from issuing a new rule similar to the former one. Then, in April 2002, OSHA unveiled a four-pronged approach to addressing ergonomic issues that consisted of guidelines, enforcement, outreach and assistance, and research. OSHA also developed specific guidelines for the nursing home industry, retail grocery store industry, poultry processing industry, and shipyards, but not for other industry classifications.

Employers should be aware, however, that all employers are subject to OSHA's General Duty Clause, Section 5 (a)(1), which states that an employer must keep the workplace free of recognized hazards, including those of an ergonomic nature. This leaves considerable ambiguity as to what constitutes an ergonomic hazard, and what is an appropriate response to such hazards that could or do exist.

While specific guidelines do not have direct applicability to other industries, the information contained in those guidelines can be extrapolated to other applications and provide helpful hints as to what, in general, constitutes a recognized or potential ergonomic hazard, and what are the generally accepted Best Management Practices (BMPs) for mitigating such hazards. This article provides an introduction to some of the types of ergonomic hazards that can be found in workplaces, and some common mitigation methods.

The objective of ergonomics design is to create a work environment that recognizes and accommodates a variety of human capabilities and limitations in a manner that reduces the potential for musculoskeletal disorders (MSDs). Most people agree that removing an identified ergonomic hazard from the workplace would be ideal, but it is not always technically or economically feasible to do so. Instead, administrative controls (e.g., training or job rotation) are often necessary to reduce the likelihood of ergonomic-related injuries.

The scope of ergonomics is very broad. Common ergonomic injuries include carpel tunnel syndrome and related maladies of the wrist and hand. These can include tendonitis, trigger finger, hand/arm vibration disease, deQuervain's disease, and myalgia. These illnesses, known as cumulative trauma disorders (CTDs), are a family of muscle, tendon, and nerve disorders that are accelerated or aggravated by repetitive motion. Administrative actions can be taken to help alleviate the cause of these disorders. Some of the more common CTDs encountered in the workplace and suggestions to help reduce the potential for CTD injuries are listed below.

For repeated actions and sustained postures:

- Provide mechanical aids (e.g., arm and wrist rests) to employees that do repetitive computer work
- Incorporate task rotation
- Modify the work load required of the individual in a particular time frame

For work requiring lifting, carrying, hoisting, pushing, and related activities:

- Provide gloves to the employees that improve their grip on the object
- Reduce the working load, reducing stress to various body parts
- Incorporate rollers and powered belt conveyers to move material
- Utilize handles to make it easier to grip items

For prolonged contact stresses from tools and equipment:

- Use elongated handles on tools, such as scissors and pliers
- Utilize rounded edges on handles and work benches
- Utilize proper tools for impact or striking activities
- Avoid tasks that require the individual to lean on wrists, elbows, or the abdomen
- Provide cushioned tool grips

For posture of the employee:

- Ensure that the workstation, tool design, and tool shape are such that it will allow the employee's body to maintain an unstrained and comfortable position

For cold conditions:

- Provide insulated gloves, making certain that they are not so bulky as to cause additional hazards to the employee
- Utilize insulated or non-conducting handles and grips
- Provide hats and additional clothing on the upper body to retain heat

This article mentions only a small portion of ergonomic hazards encountered in the workplace. To properly identify and mitigate existing and potential ergonomic hazards in the workplace it is recommended that employers consult with experts specializing in ergonomics. Changes required to mitigate identified hazards are often simple and inexpensive, and can in many cases also improve employee morale and productivity.

If you have any questions or concerns regarding ergonomic issues, please contact the Tampa office of Chastain Skillman, Inc.

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- Agriculture
- Silviculture
- Wildlife management
- Linear utility and highway rights-of-way vegetation maintenance

Permits are not required for the following activities as long as they do not cause harm to tortoises or their burrows:

- Routine yard and vegetation maintenance
- Landscaping activities
- Designing a project that allows existing burrows to remain in place as long as the activities are conducted at least 25 feet away from the burrow entrance. However, if the activity results in a significant loss of tortoise habitat and tortoises are unable to survive as a result, a permit will be required.

Permit Types & Duration, Mitigation Contributions, And Burrow Survey Requirements

The Guidelines establish a new set of permit types, mitigation contributions, and burrow survey requirements for all projects with potential gopher tortoise habitat. The permitting structure is essentially divided into three main categories, with two additional permit types to be issued only under extreme situations. The three main types are:

1. Authorized Agents
2. Site-specific relocation (on-site and off-site relocation)
3. Recipient sites

Each permit has a specified duration and requires a Mitigation Contribution. The Mitigation Contributions will be used by the FWC to support tortoise conservation measures. These fees do not cover the costs of consultants (surveys, relocation, etc.) or owners of recipient sites.

In addition, entombment of tortoises is no longer authorized under current or future permits, with the exception of Emergency Permits. Any permits issued on or before July 30, 2007 that contained provisions for entombment are grandfathered in and will not expire. However, landowners are encouraged by the FWC to voluntarily relocate all tortoises, and the FWC is committed to expediting the necessary permit amendments and assisting the landowner in locating suitable recipient sites.

Authorized Agent Permits – Authorized Agents (Agent) are individuals authorized by the FWC to conduct specific tasks relating to gopher tortoises or oversee the work of authorized assistants conducting those tasks. These permits do not grant authorization for individual projects. An Agent or landowner must still obtain project specific permits as described below. To receive an Authorized Agent Permit, the applicant must meet experience and/or education requirements to conduct the tasks for which they are applying. Activities include:

- Tortoise surveys
- Capture of tortoises using bucket or live traps, or hand shovel excavations
- Capture of tortoises using modified pulling rod
- Transport, marking, and release of tortoises
- Collection of blood samples
- Supervision of tortoise burrow excavations using mechanical equipment (for example, backhoe excavations)

An Agent may not wish to conduct all of the tasks listed above due to experience, education, or preference. Agents and their authorized assistants can only perform the activities for which they are approved.

Authorized Agent Permits are good for 2 years and require a one-time mitigation contribution of $500. Permits may be extended in 2-year increments without additional payment.

Site-Specific Relocation Permits – There are two main categories of site-specific relocation permits: 10 or Fewer Burrows Permits and Conservation Permits.

<u>10 or Fewer Burrows Permits</u>

For sites that have 10 or fewer burrows impacted by the proposed development, the landowner has two permit options: on-site relocation or off-site relocation. Phased projects can only utilize this permit once per project. Future phases that require the relocation of additional tortoises will be permitted using a Conservation Permit.

An On-Site Relocation Permit allows the landowner or other trained individuals to capture tortoises and relocate them to an on-site location as specified within the permit. The landowner may also utilize the services of an Authorized Agent to conduct these activities.

Off-Site Relocation Permits grant permission to relocate tortoises off the development site to a certified recipient site. Off-site relocation requires the use of an Authorized Agent.

On-site and off-site relocation permits are good for 6 months and require a mitigation contribution of $200.

<u>Conservation Permits</u>

Projects that require relocation of 10 or more tortoises or have previously used a 10 or Fewer Burrows permit will be issued a Conservation Permit. Conservation Per-

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PLEASE JOIN US AS WE WELCOME OUR NEW ASSOCIATES

In Lakeland

Our Environmental Engineering department has added **Michael "Mike" A. Schenk, PE**. He graduated from the University of Central Florida with a Bachelor's degree in Civil Engineering. At CSI, he will be serving as a Senior Project Manager, working out of our Lakeland office. Mike brings 28 years of experience to the CSI team.

Our Corporate Administration department has added **Kristen M. Buzzanca, Esq**. She graduated from the University of South Florida with a Bachelor's degree in Criminology. She also attended Stetson College of Law, where she received her Juris Doctorate degree. At CSI, Kristen will be serving as our Corporate Contracts Administrator.

Project Spotlight

Chastain-Skillman, Inc. (CSI) provided engineering design services for the re-alignment of Main Street on the north side of Lake Mirror.

This re-alignment moved the street to the north, creating room for the completion of a new park section and the final leg of the promenade, which will completely encircle Lake Mirror. The City's Public Works and Parks & Recreation Departments had oversight responsibilities.

Additional related projects, which will be completed in a domino effect, are the In-Town Bypass Park & Ride Lot, and the Massachusetts Avenue Streetscape. These projects were combined by the City into one construction contract in order to achieve greater cost efficiency.

Stormwater pond designed to flow under bridged walkway to the lake.

A new stormwater system was also constructed to improve the water quality of Lake Mirror, as stormwater runoff was discharging directly into the lake. The re-alignment project included closing Main Street between Massachusetts Avenue and Iowa Avenue and between Mirror Street and Lake Avenue. Parallel parking spaces were added along the north side of Lake Mirror. Streetscaping, historic lighting, and the construction of Main Street from Massachusetts Avenue to Lake Parker Avenue are all part of the total project package. The final promenade construction along Main Street connects several existing parks encircling the lake, making it the crown jewel of the City's already amazing park system.

Re-aligned Main Street flows along the north side of Lake Mirror and around the Fire Station.

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mits allow on-site or off-site relocation, and all relocation tasks must be conducted by an Authorized Agent.

Conservation permits are good for 12 months and require a mitigation contribution of $200 for the first 10 burrows. Each additional tortoise requires a $300 fee if being relocated to a protected site or $3,000 per tortoise if the recipient site is unprotected.

Temporary Exclusion Permits for Major Linear Utility Corridors are special Conservation Permits, which allow projects, such as natural gas or electric transmission lines, to be constructed through tortoise habitat. Tortoises are captured, temporarily relocated outside of the construction area, and excluded from the corridor during the construction process using silt fence or other suitable material. Upon completion of the project, tortoises are allowed to return to site within the utility corridor.

Exclusion permits are good for 12 months and require a mitigation contribution of $100 - $300 dollars per tortoise. The actual mitigation contribution will be determined during the permitting process.

Recipient Site Permits – Recipient sites are lands set aside for the purpose providing habitat for relocated tortoises. These lands have stringent requirements to ensure long-term security for the tortoises and their habitat. There are two types of recipient sites: Those providing long-term protection and those providing short-term or no protection.

Lands being considered as recipient sites must meet specific suitability criteria. Minimum (Acceptable) and highly desirable features (Desirable) are set forth in the Guidelines. The following is a brief description of a few of the criteria considered for sites providing long-term protection (criteria for short-term and unprotected sites not discussed in this article):

- Land size – Minimum of 40 contiguous acres of upland with Acceptable soil and vegetation conditions.
- Soils – Soils must meet texture and depth to water table (DWT) criteria. Acceptable soils are moderately-well to excessively drained and have a DWT of 1.5 feet or more. Desirable soils have a DWT of 4.3 feet or more and are excessively drained.
- Vegetation – Sites with at least 30% cover by herbaceous vegetation and average canopy cover of 60% or less meet the Acceptable criteria. Whereas, sites with greater than 50% herbaceous vegetation and average canopy cover of 40% or less are considered Desirable.

Recipient site permits require a mitigation contribution of $500 and those sites providing long-term protection measures do not expire. Recipient sites offering short-term or no protection for tortoises require renewal every 2 years, but no additional mitigation contribution.

Extreme Case Permits – Emergency Take Without Relocation Permits and Settlement Permits are issued by the FWC only under extreme situations.

Emergency Take Permits are issued only when there is an immediate danger to public health or safety or in response to an official state of emergency issued by the Governor or local government.

Settlement Permits are the second form of an extreme case permit and are only issued after law enforcement investigations are completed.

Emergency Take and Settlement Permits are handled on a case-by-case basis and both require a mitigation contribution of $4,000 per tortoise.

Burrow Surveys – Burrow surveys are required on potential gopher tortoise habitat slated for development. The purpose of the surveys is to determine the location of all *Potentially Occupied Burrows* within the gopher tortoise habitat, so that all of the tortoises within the developed property can be captured and relocated. All surveys must be conducted by an Authorized Agent.

Potentially Occupied Burrows is a new classification, combining the active and inactive burrows classifications. A burrow is considered potentially occupied even if it shows no obvious signs of use. Burrows that have collapsed entrances or are filled with leaves, soil, and vegetation can be considered Abandoned. Abandoned burrows are not considered a Potentially Occupied Burrow.

A pre-application survey is required of at least 15% of the potential gopher tortoise habitat. The estimate will allow the landowner and FWC to determine the approximate number of tortoises that will require relocation. This "baseline" number is calculated using the following formula:

Total Potentially Occupied Burrows/Total Acres Within Survey Area X 0.50 = Tortoises/Acre

Prior to capturing and relocating tortoises, a 100% survey of all tortoise habitat to be impacted within the project area is required to ensure that all no tortoises are left behind.

Conclusion

The forthcoming Guidelines will have a noticeable effect on development of lands containing gopher tortoise habitat. Future projects will require greater planning to make sure that tortoises and their habitat are protected within the project area or that tortoises are relocated to acceptable recipient sites. If you have any questions or concerns regarding the new Guidelines or how they may affect your project, please contact Chastain-Skillman, Inc. for more information.

References

Gopher Tortoise Permitting Guidelines - http://myfwc.com/permits/Protected-Wildlife/apps/GopherTortoise_PermitGuidelines.pdf

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Author's granddaughter, Sarah, observing a gopher tortoise.

IS THERE A TREND IN THAT DATA? (PART 1 OF 2)

By James R. Chastain, Jr., PhD, PE, MPH

In our digital age we are awash in data. This is especially true in the engineering, environmental and public health fields. Whether the data results from routine compliance monitoring or special purpose studies, it is frequently desirable to infer whether a trend has developed…and if so what caused the trend. One of the most common statistical tools used for this purpose is linear regression. Linear regression can, in fact, be a very useful tool for organizing and evaluating data, however, the proliferation of personal computers and computational packages (ex. Excel©) have made it easy for inexperienced users to misapply this procedure. The purpose of this article is to discuss the basic concepts of linear regression and its application to trend estimation. At the outset it should be mentioned that this topic is fairly robust and this article sketches only a high level summary. One of my textbooks on the topic is 1396 pages long, so it's unreasonable to expect to cover all the subtleties in these few pages. Still, it is hoped that this overview will be helpful to the casual user and possibly spur an interest for further study.

As a preliminary note, most technical professionals typically think of regression models in terms of developing a model that will allow prediction of future values. This is one use of regression, but it is important to be aware of other uses that may be of equal or greater importance. They are:

- Characterize a relationship between variables
- Control for the effects of other variables (i.e. what is the contribution of this particular variable when the other factors are held constant?)
- Determine the importance/priority among the different variables (i.e. which are the most important?)
- Assess the effects of interaction among the variables.

So an informed analysis of the data should begin with a firm concept of how the data should be collected and what the intended use of the regression equation will be. Understanding that regression analysis can provide numerous insights into the data structure and its effects can prove very helpful later in data interpretation.

The Big Picture

While the technical details of regression analysis can become somewhat complex, the core concepts underlying linear regression are straightforward. To illustrate this a little more clearly, observe Figure 1. Fundamentally, the mathematical techniques

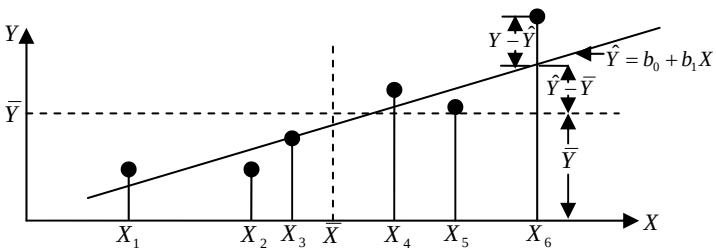

Figure 1

are developed to determine the level of deviation from the grand mean (average) of all the Y-values of the data. This is noted as $\bar{Y}$ on the figure. The individual data points are indicated by Y, and the computed y-value from the linear regression equation is $\hat{Y}$. The greater the deviation from the grand mean, the more likely that there is a correlation between the predictor (independent; X-values) variables and the response (dependent; Y-values) variables. Thus, the interpretation is that unless there is a significant difference between the computed trend line and the grand mean ($\hat{Y} - \bar{Y}$) no trend exists. Why is that? Because it indicates that no matter what the value of X, there is no difference in Y, thus there is no trend. It will probably be necessary to concentrate on the figure for a few minutes, but once the philosophical basis for the analysis is clear, comprehending regression output becomes more intelligible.

The mathematical techniques for determining the level of deviation from grand mean are based on (1) the concept of statistical variation (related to standard deviation) and (2) the correlation of sum of squares associated with each variable through the use of the Fisher distribution. To develop these concepts mathematically, certain assumptions are made in order to develop the computational procedure. For example, as you might expect, linear regression assumes that the relationship between the predictor and response variables are linear (as opposed to exponential, logarithmic, logistic, etc.). Mathematically, the model will be expressed in the following form for computing a straight line that most students learned in high school:

$$\mathbf{y = a + bx} \qquad \textbf{Equation 1}$$

Because the most practical situations involve more than one predictor variable, the equation is generalized to the form:

$$\boldsymbol{\mu}_{Y|X1,\,X2,\ldots,Xp} = \mathbf{a + b_1x_1 + b_2x_2 + \ldots + b_px_p + e} \qquad \textbf{Equation 2}$$

A very important aspect of this equation should be noted. In statistical notation, **μ**, is generally used to denote the mean of values. Consequently, $\boldsymbol{\mu}_{Y|X1,\,X2,\ldots,Xp}$ is to be read as saying that the regression line is the mean of y-values given the x-values of variables X_1, X_2, to X_p. Therefore, understand that **μ** will <u>not</u> estimate the range of individual values; it is an estimate of the mean. Misunderstanding this fact contributes to frequent misinterpretation of linear regression.

It might be helpful at the outset to sketch the general process to be used when developing a regression model (mathematical equation) to describe the data. Textbooks refer to this as "fitting" a model to the data. The objective is to use the <u>fewest</u> number of variables in the fitted model to adequately describe the response variable function. This is called the **parsimony principle**. The following five-step process applies to any regression technique (linear, exponential, logistic, etc.):

1. Perform an exploratory data analysis (get to know your data)
2. Decide which regression model to use (in this article: linear regression)
3. Fit the model to the data

4. Check the model
5. Document and interpret the model

The novice typically takes a data set, performs Step 3 by itself and then begins to draw conclusions from the resulting model. This can easily lead to poor decision-making.

Get to know your data

The first step should be to perform a preliminary Exploratory Data Analysis (EDA). The objective of this effort is to get a feel for the raw data set and to look for obvious problems such as data entry errors, obvious outliers, etc. Examples of selected EDA might include: scatter-plot of data, list 10 largest/10 smallest values, mean/median, distribution tests/plots (dot plot, normal data plot, stem-leaf plot), etc. Since this article is considering linear data relationships, one purpose of examining the raw data is to get a sense of whether the data has a linear trend to it or not. It is also important to look for potential correlations between predictor variables. This may be a signal of collinearity problems, or non-linear relationships, which could reduce the validity of the model. There really is no substitute for having a "feel" for the data, including data collection procedures, plausible range of values, proper (and possible) units of measurement, data type, etc. Again, the purpose is to do as much preliminary data checking as possible prior to actually performing the regression analysis. This will save wasted effort down the road.

Decide what regression model to use

If there was not a clear understanding of the likely data relationships prior to data collection, the next step is to use the EDA insights to select promising statistical models. This requires a knowledge of the underlying assumptions for the alternative statistical models as well as how to interpret and apply the results. For the purpose of this article, linear regression has been stipulated.

Fit the model to the data

A formal presentation of this important step is quite involved. However, for the purpose of this article it will be assumed that a computer with a statistical software package is available which will handle the computational details. Each program has a specific data entry process so we won't consider that either. However, the computer analyses typically proceed in similar fashion.

The development of the equation for the line used to summarize the data trend (the regression line) is based upon an analysis of the sum of squares. The objective is to develop an equation for the line that results in the smallest sum of squares in deviation from the computed line. Referring to Figure 1 this is accomplished by minimizing the sum of squares between the computed line and all of the data points ($Y - \hat{Y}$) and the sum of squares between the computed line and the grand mean ($\hat{Y} - \bar{Y}$). Each variable that is being considered in the analysis will contribute to the total sum of squares.

In many cases the analyst doesn't know which variables to include in the analysis and which to eliminate. Most computer packages give three options for trying to find the best combination of variables. These are usually classified as (1) forward selection, (2) backward elimination and (3) stepwise regression. There is no universally accepted "best" process, but many people use the stepwise process because it allows the computer to estimate the optimal solution. It is not a bad idea to try several selection options to see if the same result is reached.

There are a number of criteria to know which variables are important. For multivariable regression the most common is the R^2 value which is also called the **coefficient of determination**. This is analogous to the correlation coefficient, r^2, in simple two variable regression. Both parameters have a value between 0.0 and 1.0. The closer R^2 is to 1.0 the more effectively the predictor and response variables are related. The adjusted R^2, R^2_{adj}, is actually preferable when there are multiple variables, and especially if the number of data points is different with each variable.

Another common way of assessing the priority of a variable is to look at the "p-value". (The use and misuse of p-values has a long literary history, but it is beyond the scope of this article to elaborate on this topic.) By convention a variable is considered "significant" if it has a p-value of 0.05 or less. The smaller the value, the more "significant" it is deemed to be. This is an arbitrary number though and must be considered in the context of the overall analysis. One would find the value for each variable in the regression table in the computer printout. It is usually placed at the far right end of the regression analysis table.

There are numerous other techniques for fitting (selecting) the best model to the data, but these are common criteria. Other considerations might include such things as whether the line has an intercept or is fixed at the origin. The reason for this is that some situations occur where intercept values equaling zero don't have a physical meaning. For example, if one was developing a regression analysis of property damage versus wind speed, and there was an intercept value of $50,000, the uncensored interpretation would be $50,000 damage occurring at a wind speed of zero. As a general rule it is better to allow the intercept to float where the regression line is computed and restrict the use of the regression equation at low values of the predictor variable rather than force the line through the origin. This is an example of why one should not develop or use a regression analysis without understanding what the underlying assumptions were when the model was developed.

Up to this point no mention of the error value, *e* in the equation 2, has been made. Unless there is a perfect correlation in the data, the Sum of Squares analysis mentioned above will not balance perfectly. The part of the variance from the fitted regression line is called the Error Sum of Squares (SSE) and this is used to estimate how accurately the regression line estimates the actual data. This is a key component in the computation of R^2 discussed above, as well as a number of the residual analysis procedures mentioned in the next section.

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This newsletter is provided solely for informational purposes and presents only highly condensed summaries relating to the topics presented. Therefore, it should not be relied upon as a complete record for purposes of regulatory compliance, nor is it intended to furnish advice adequate to any particular circumstances. For additional information on any of the topics in this newsletter, please contact the author, or Allan Duhm, (863) 646-1402, or e-mail us.

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