

## **The theory of Autoregulation as it relates to management of wild horses**

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In the dialogue relating to the management of wild horse populations, certain wild horse advocates have advanced the idea of autoregulation. Autoregulation is a theory that has been promoted by Wildlife Ecologist Craig Downer, among others. It has been incorrectly described by persons opposed to less invasive population management options as "self regulation," and has been derided as some form of fringe science. Nonetheless peer review papers discussing various observations and factors that contribute to the effect known as "autoregulation" date back to at least the 1950s.

Following this commentary is a reproduction of a 2007 abstract by Rogovin and Moskin that summarizes the various factors that contribute to population regulation in mammals. This abstract also identifies a number of issues that need to be studied and more clearly understood.

Among the concerns expressed by wild horse advocates are the following.

1. There is a lack of accurate hard data correlating resources and other autoregulation factors to horse herd population and recruitment rates. Presently detailed monitoring and relevant resource analysis is not being adequately funded. Therefore it is unlikely that any autoregulatory trends would be recognized, let alone analyzed and validated.
2. Based on the prevailing theories in this field of mammalian biology, it is conceivable that gathers of large proportions of populations as currently conducted disrupt the environmental and physiological regulatory process, and as a result could likely cause birth rates and recruitment rates to spike.
3. A better understanding of autoregulation on Western ranges, based on effective research and application of relevant science, could produce some changes in wild horse management approaches that are less invasive, less costly and would not produce such undesirable side effects as stimulating an increase in recruitment in the populations that remain, and the suffering of increased mortality among the populations removed.
4. We can find no relevant contemporary data addressing the impacts resulting from aggressive horse removals that may cause predators to rely on domestic livestock as prey, and correspondingly, the reduction in livestock losses that could occur if elder horses were left on public lands and culled by predators. (Given the sharp cutbacks in the state's trapper force, predation is likely to increase.)

It is theoretically conceivable that such simple approaches as being more selective of the ages of horses removed could result in fewer horses requiring removal and a reduction in recruitment rate spikes. However as Rogovin and Moskin point out, there is a lack of breed specific data on the subject of mammalian population autoregulation, so objective breed specific research is warranted.

Nonetheless if criteria could be developed whereby population management can rely more on natural - environmental factors than exist today, even if only incrementally, then fluctuations in range conditions and the need for the costly outright removal of horses could be reduced to some extent.

## Autoregulation in mammalian populations and stress: an old theme revisited

[Article translated from Russian]

Rogovin KA, Moshkin MP.

### Abstract

We consider the current state of four hypotheses explaining the auto-regulation of population numbers in mammals: 1. Density -- and frequency-dependent selection of genetically determined stereotypes of behavior (Chity, 1960, 1967). 2. Physiological effects of stress conditioned by redundant density (Christian, 1950, 1963; Christian, LeMunyan, 1958). 3. Maternal effects on offspring (Ward, 1984; Lee, MacDonald, 1985). 4. Kin hypothesis based on assumption of temporal variation in relatedness of neighbors (Charnov, Finerty, 1980). All four hypotheses consider the density of individuals or their signals (visual, acoustic, or chemical) to be the main factor of regulation, and are based on an assumption of density-dependent variation in spacing behavior. The local density is considered to be derived from the ability of individuals to disperse. This ability appears to be determined by internal (including genetic), as well as external limiting factors. The above hypotheses are not quite alternative. In fact, all four hypotheses imply stress (directly or indirectly) as a regulatory mechanism within the population, although its role is usually associated with J. Christian's hypothesis. Besides the direct density-dependent, physical exclusion of competitors, social behavior may activate and control neuroendocrine regulatory mechanisms which lead to a reduction in breeding intensity and maturation, and increased mortality due to functional disorders and immunity suppression. To date we cannot reject any of these hypotheses. We believe that progress in understanding the role of physiological stress in the regulation of population density in mammals will depend on attention to the following factors: 1. Abundance (availability) of feeding resources, predators and parasites are real factors affecting levels of physiological stress in wild mammals. Population density depends on these factors, and their role in the stress dynamic in the population can be decisive. 2. Social conflicts (density-dependent behavior) are usually considered to be the main factor of physiological stress and a keystone of autoregulation mediated by stress. We still pay little attention to the role of stress hormones and neurotransmitters in the regulation of animal behavior. Both hormones and neurotransmitters can greatly affect individual behavior, including interactions between individuals in the population. 3. A common viewpoint is that stress negatively influences ontogenesis, reproduction, and survival. At the same time, in nature we often observe a positive relationship between stress and reproduction, or stress and survival, and we must pay more attention to this phenomenon. 4. In spite of a well developed theory about the role of stress in the regulation of reproduction and survival in mammalian populations, we still do not pay much to species-specific characteristics of the neuroendocrine mechanism of stress and its effects on population demography.