Vignette for *rule based objectives* and ConsNet

ConsNet [2,3,4] is a new *dominant tabu search approach* to the solution of the well-studied *conservation area network design problem* (CANP), a variant of the classical set cover problem (SCP). The goal is to find the smallest amount of land that (when placed under conservation) will contain and protect a specified representation level of biodiversity resources. ConsNet extends the “basic” CANP by explicitly including required spatial requirements. The underlying search engine, modular adaptive self-learning tabu search (MASTS) [1], incorporates adaptive tabu search, dynamic neighborhood selection, and the *new* concept of *rule-based objectives*. Rule based objectives exhaustively compare, one at a time, pairs of neighborhood solutions until the “best” solution is found. This process makes explicit use of the fact that, at each iteration, tabu search selects the best non-tabu neighbor, in an *ordinal* sense (i.e., the amount of superiority on an interval scale is unimportant), as the new incumbent solution. The ability to utilize *intransitive* orderings within a rule-based objective gives the search flexibility to ignore certain solutions that will not lead to overall search improvement, enhancing solution quality while saving computation. This intransitive search context is a natural extension of the *implicit temporal intransitivity* enforced by a tabu memory structure of a tabu search in the selection of the new incumbent solution. ConsNet demonstrates how rule-based objectives can be used to design near optimal conservation area networks in which the individual conservation areas are larger, spatial coherent and compact, well connected to allow protected paths for migratory species, and provide geographic replication of endangered species.

**References**

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2. Ciarleglio, M., J.W. Barnes and S. Sarkar, ConsNet—A tabu search approach to the spatially coherent conservation area network design problem, *Journal of Heuristics*, 2008, DOI 10.1007/s10732-008-9098-7.
3. Ciarleglio, M., J.W. Barnes and S. Sarkar, ConsNet: new software for the selection of conservation area networks with spatial and multi-criteria analyses, *Ecography*, 32, 2009, 205-209.
4. <http://uts.cc.utexas.edu/~consbio/Cons/consnet_home.html>, ConsNet - Advanced Software for Systematic Conservation Planning