

Similarity Index Calculator

Summary. The Similarity Index Calculator is a Microsoft Office 2007 Excel workbook that computes the similarity index for a sampled plant community relative to its reference plant community. The Similarity Index Calculator also converts annual production by species from pounds/acre to percentage of total community production for use in the National Resources Inventory Grazing Land On-Site Study. The Similarity Index Calculator is posted online at the NRCS New Mexico Web site.

Background. Similarity index (SI) provides a measure of how climate and management have affected a plant community and is used to assess forage value rating of grazing land and ecological site status (USDA, NRCS 2003). SI is expressed as the percentage, by weight, of the reference plant community that is present on a site. SI rating plays a key role in conservation planning and in allocating federal funds in landowner assistance programs administered by the Natural Resources Conservation Service (NRCS).

According to the National Range and Pasture Handbook (USDA, NRCS 2003), SI is calculated by limiting a species' allowable production to its representative value (RV) production (from the Ecological Site Description [ESD] reference community) and by limiting total allowable production of all species in a species group (herein called "groups") to its ESD reference community group RV production. However, while ESDs list values for annual production under low- and high-production conditions by species and group, they do not list RV production values for species or groups. Spreadsheets currently used to compute SI (available for download from the NRCS Web sites of several states) do not calculate RV production values for species or groups, nor do they limit group allowable production to group RV production; hence, they do not compute SI correctly.

The National Resources Inventory (NRI) Grazing Land On-Site Study assesses the condition and trend of natural resources on US nonfederal lands. It is "the most comprehensive database of its kind ever attempted anywhere in the world" (USDA, NRCS 2009). To determine SI using NRI-developed software, the NRI handbook (USDA, NRCS 2009) instructs the data collector to:

- Determine the percent of allowable production (% Allowable Production) for each listed plant species.
- Use the Ecological Site Description to determine this factor for each species.
- Assume an average year when making this decision.
- Enter values to the nearest percent.

However, the NRI handbook does not specify how to derive % Allowable Production values for an "average year" from the low- and high-production values expressed only in pounds/acre in ESDs. For many ESDs, the sum of all species production values in a group exceeds its group production value, or the sum of all species production values from all groups in a community exceeds its community production value, making the calculation of a species' production as a percentage of total community production especially problematic.

SI is a useful method of quantifying temporal or spatial differences in plant community composition; however, its utility is challenged by error and inconsistency in its calculation. Effective conservation planning, the proper allocation of landowner assistance funds, and the validity of NRI data require that SI be calculated correctly and consistently.

Similarity Index Calculator. While ESDs do not list RV production values by species or group, they do list RV production values by plant type (grass, forb, shrub, etc.). The SI Calculator generates RV production values for ESD reference community species and groups; the relative proportions of their low, RV, and high production values are proportional to the low, RV, and high production values of their respective plant type. For species and groups whose plant-type RV production value is not entered in the SI Calculator (e.g., plant-type RV production value is not listed in the ESD), the SI Calculator uses the arithmetic mean of their respective low- and high-production values for their RV production value. User-defined RV production values for species and groups can be used in the SI Calculator if necessary (e.g., ESD lacks reference community production values). The SI Calculator limits a species' allowable production to its reference community species RV production, and it limits total allowable production of all species in a group to its reference community group RV production.

Data for an ESD reference plant community are entered only once in the SI Calculator; it is then saved with a filename denoting that particular ESD reference plant community, and it can then be reused with field data from different sampling dates or locations. As ESD reference plant community data are entered in the SI Calculator, the % Allowable Production values are displayed, and SI is automatically calculated as field data are entered. (In computing % Allowable Production, the SI Calculator maintains relative within-group species proportions while limiting the sums of within-group species RV production to their respective group RV production; the % Allowable Production values for all species in the reference community sum to 100.)

The SI Calculator is available for download from the NRCS New Mexico Technical Resources Web site (<http://www.nm.nrcs.usda.gov/technical/tech-notes/range.html>); ESDs are stored in the Ecological Site Information System (ESIS) online database (<http://esis.sc.egov.usda.gov/>). Ideally, every ESD reference plant community will soon be hyperlinked to its pre-filled SI Calculator, requiring only field-data entry to generate SI for a sampled plant community.

Literature Cited

USDA, NRCS. 2009. National Resources Inventory Grazing Land On-Site Study Handbook of Instructions. 205 pp.

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