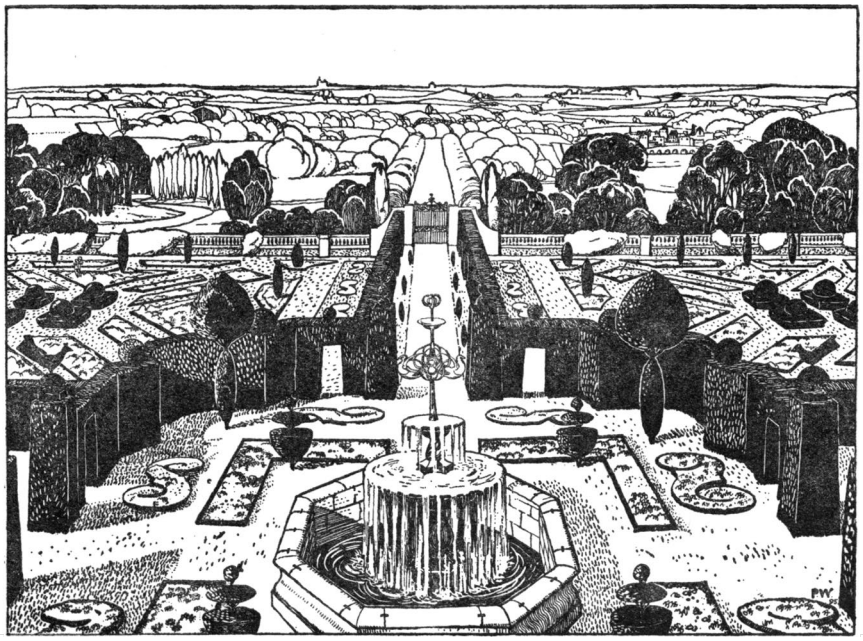
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Perspective View of Garden in Plan Following by John Dando Sedding (1902).
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Lesson – Spatial Ecology: Landscape Design Contest

By Heidi Scott, SESYNC | June 21, 2022

Overview:

This is the second lesson in a three-part series on spatial ecology. It will be helpful to have read the companion explainer article on landscapes and spatial ecology first and then to complete these lessons in order, as they build upon concepts. The other lessons in this series are available here:

- Lesson 1: Land Sparing versus Land Sharing
- Lesson 3: Integrating Resilience Theory to Understand Ecosystem Service Flows

Spatial ecology provides analytical methods to approach landscape design with the best possible outcomes for humans and their natural environments in urban, suburban, and rural areas. Human health is positively affected by access to green spaces, with measurable physical and mental health benefits from so called "nature doses" that reduce the "extinction of experience" that results from lives lived indoors in the built environment without access to green space. It is crucial for learners to be able to understand and use spatial ecology to measure, design, and implement more healthful interfaces between human infrastructure and green space. In addition, students will learn how complementary benefits, such as greater physical and mental health, local food production, and wildlife habitat may coexist in well-planned spatial ecologies across urban, suburban, and rural habitats.

Assumed Prior Knowledge:

Complete SESYNC's Spatial Ecology Lesson 1: Sparing vs. Sharing and read SESYNC's Spatial Ecology Explainer. The lesson is appropriate for undergraduate and graduates and has a design element that will reward artistry.

Learning Objectives:

- Analyze personal landscapes for their spatial ecology features, benefits, and liabilities.
- Apply analytical principles of spatial ecology to three different types of landscape, seeking to improve their design with measurable human, wildlife, and ecosystem service gains.
- Collaborate with peers to enumerate and prioritize desirable land use designs, with an emphasis on reducing petroculture and achieving sustainable outcomes that enhance human ecologies and equality across identity groups.
- Use mapping layers to hypothesize how new spatial designs will affect the well-being of communities and foster interspecies mutualism.

Key Terms and Concepts:

Landscape design, land sharing, green space, biodiversity, ecosystem services, epidemiology, environmental justice, intersectionality, petroculture, aesthetics, restorative justice

The "Hook" (suggestions for quickly engaging students):

(10 min.) Fighting the Extinction of Experience: A Habitat Autobiography

- Have students close their eyes and picture the exterior of their home environment. Let them have 2 min. just to clarify the picture in their mind without judgment. Then spend 3–5 min. listing the land uses (is it parking lots, lawns, or biodiverse green spaces?) For those with limited environmental enrichment and poor natural infrastructure, human hardscapes will dominate. For those with greater immersion in the green habitat, they might be able to enumerate plant species and local wildlife.
- Now ask each student to evaluate and judge this home/nature interface in terms of its physical and mental health effects, their sense of how ecosystem services are affected by the design, and critically, correlative elements of human identity such as class, race, gender, immigrant status, parental occupation, and neighborhood. Now that each student has a brief "habitat autobiography" in mind, proceed to the lesson.

Teaching Assignments:

Spatial Ecology Design Contest (Three, 75-min. classes)

- **Class Session 1:** Steps 1–5
- **Class Session 2:** Steps 6–12
- **Class Session 3:** Steps 13–16

1. **Class 1:**
   Prior to Class: Students should read the Spatial Ecology readings compiled for this lesson (below) and should be familiar with the Cirino et al. 2022 study from Lesson 1. It will also be useful to have read the brief primer on Petroculture for context and inspiration.

   Lesson_Landscape_Design_Contest_Compiled_Readings.pdf

   Petroculture_Primer.pdf

2. **Small Group Discussion**: In small groups of three to four, have them discuss the major insights from this research, including:

   - Land sharing in urban areas and epidemiology
   - Subdisciplines of spatial ecology and how they may be applied to specific challenges and environments
   - How landscape complexity and spatial distribution of elements could generally contribute to biodiversity, water quality, pollination, pest control, and aesthetic value
   - How the use of 3D LIDAR mapping may further innovate integrative landscape planning.

3. **Roundup Session:** Summarize these findings in a 10-min. class-wide roundup session. From the roundup, students should gain a sense of their personal investment in improving specific environments.

4. **Design Teams:** Ask students to volunteer for one of three design teams: **urban**, **suburban**, and **rural**. Divide students into these three groups, with each group having no more than four individuals (large classes will have multiple teams for each landscape type). Assign them each a segment map dedicated to their landscape type (PPT below).

   Spatial_Ecology_Landscape_Design_Contest_Lesson_Slides_Accessible.pptx

5. **End of Class:** Finish this class session by having each group scrutinize the image of their design challenge landscape: The Bronx, NY (urban); Gaithersburg, MD (suburban); and Crawford County, IA (rural). Have groups compile three lists:

   1. Existing natural amenities (tree cover, parks, waterways)
   2. Existing design challenges (hardscape cover, highway fragmentation, monotonous land use)
   3. Opportunities (greenways, footpaths, rewilding, pollinator swales). Ask students to carry the image of this space in their mind, passively meditating on what spatial redesigns could improve its ecosystem function and habitability.

6. **Class 2:**
   Next Class Session: Have each team implement its design priorities and note the associated challenges.

   For example, the urban teams may prioritize “pedestrian access to parklands” and list “highways and parking lots” as hurdles to such access. Suburban teams may desire “food plots and pollinator

strips" and list "monoculture lawns and wide roadways" as problems. The rural teams may seek "riparian buffers for water quality" and list "monoculture farms with irrigation ditches" as their challenge. Ideally, each group will have two or three design priorities and a clear sense of the challenges to implementing them.

7. **Map Layers:** Now, have the teams pull up their landscape image in an art/graphic design program such as Adobe Illustrator, GIMP (free), Krita (free), or their choice of art software that allows layers. Have students create a new map layer to identify problem areas with red outlines, amenities with green outlines, and opportunities in yellow. Spaces may play double duty: for example, a vast gray parking lot may be outlined in red and yellow—it's an existing problem and an opportunity for spatial redesign.

8. **Land-Use Identification:** Start by identifying general ratios of land use: What approximate proportion of the image is housing (est. density), transportation, retail, land sharing (trees along roadways), riparian, etc.? Are these proportions ideal, or would the landscape benefit from redistribution in specific ways? Would creation of natural corridors for organismal dispersal and human recreation improve the benefits?

9. **Petroculture:** Alert students to the extent to which all of these spaces are designed around petroculture, that is, the space allotted to roads, parking lots, consumerism, gas-maintained lawns, and vast monocultures of commodity crops that are maintained by gas/diesel equipment. Each of these uses diminishes ecosystem services while exacerbating pollution. Ask the students what natural biophysical processes are impeded by these designs? (If they need a hint, focus them first on natural hydrology and infiltration of rain or on the flux of gasses between ecosystems and the atmosphere.)

10. **Debate and Design:** Have the teams spend at least 30 min. debating and designing various alternative land uses for their areas of concern. After that exploration, each team should have a map with new design ideas that show how land sharing and redistributed land-use proportions alleviate specific problems. Each team should upload their design image into a shared course space.

11. **Discussion across Groups:** All groups with the same landscape type should consider the priorities and designs of other groups and provide constructive critiques and cross-references to their own designs (10 min.). Allow the groups to inform each other with best ideas and practices.

12. **As Homework:** Ask each group to finalize its redesign image and upload it for a brief presentation. They should also write a narrative of their design priorities and provide keys on the map of where these priorities are implemented. Each group has a 10-min. window to present on their priorities, challenges, and solutions, both in narrative and with the visual of the map redesign.

13. **Class 3:**
    Presentations: The last class session for this lesson is a presentation day. Each group has a 10-minute window to present on their priorities, challenges, and solutions, both in narrative and with the visual of the map redesign.

14. **Voting:** After each category has been presented by the relevant groups, have the whole class vote on their favorite urban, suburban, and rural spatial redesign. Highlight these three designs in a shared course space.

15. **Reflection:** When appropriate, be sure to integrate human identity and equality measures that pay attention to how historical practices that have marginalized certain groups are actively engaged in this redesign. Also consider how the redesign has ameliorated some of the damage of 20th-century petroculture design. Finally, ask whether 3D mapping and a vertical dimension would enrich their design and ability to track land-use changes into the future.

16. **Writing Exercise:** Have each student choose their overall favorite design, regardless of landscape (that is, someone from a suburban group may think further on a rural design). Each student should write a short narrative (~1,000 words) that analyzes the spatial dynamics, ecosystem services, costs of implementation, and quality of life and wildlife that they think would result. Have each student submit this analysis with the design of their choice.

Background Information for the Instructor:

1. **Introduction to Spatial Ecology and Its Relevance for Conservation**

    - How space directly and indirectly affects biodiversity and ecosystem functioning is the focus of several subdisciplines in the life sciences. All of these subdisciplines share concepts and analytical methods that stem from the field of spatial ecology. Spatial ecology focuses on the study and modeling of the role(s) of space on ecological processes that in turn affects ecological patterns. Our goal is to introduce why space is important for ecology and conservation, and how various components of space can inform ecological processes.

    - Fletcher, R., & Fortin, M.J. (2018). Introduction to Spatial Ecology and Its Relevance for Conservation. In: *Spatial Ecology and Conservation Modelin*g (pp. 1-13). Springer, Cham. https://doi.org/10.1007/978-3-030-01989-1_1

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- Duarte, G.T., Santos, P.M., Cornelissen, T.G. et al. (2018). The effects of landscape patterns on ecosystem services: Meta-analyses of landscape services. *Landscape Ecology, 33*, 1247-1257. https://doi.org/10.1007/s10980-018-0673-5

- Fletcher, R., & Fortin, M.J. (2019). Introduction to spatial ecology and its relevance for conservation. *Spatial Ecology and Conservation Modeling*, pp. 1-13. Springer, Cham. https://link.springer.com/chapter/10.1007/978-3-030-01989-1_1

- Lepczyk, C.A., Wedding, L.M., Asner, G.P. et al. (2021). Advancing landscape and seascape ecology from a 2D to a 3D science. *BioScience, 71*(6), 596-608. https://doi.org/10.1093/biosci/biab001

- Szeman, I. (2018, June 4). Applying a humanities approach to energy use. *Research Features*. https://researchfeatures.com/applying-humanities-approach-energy-use/

Related SESYNC Content:

- Palmer, M.A. (2022, June 10). *Explainer – Landscape and Spatial Ecology*. SESYNC. https://www.sesync.org/resources/landscape-and-spatial-ecology
- Scott, H. (2022, June 21). *Lesson – Spatial Ecology: Land Sparing versus Land Sharing*. SESYNC. https://www.sesync.org/resources/spatial-ecology-land-sparing-versus-land-sharing
- Palmer, M.A., & Scott, H. (2022, August 11). *Lesson – Integrating Spatial Ecology & Resilience Theory to Understand Ecosystem Service Flows*. SESYNC. https://www.sesync.org/resources/integrating-spatial-ecology-and-resilience-theory-understand-ecosystem-service-flows

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