FOREST BIOTECHNOLOGY: ENVIRONMENTAL ETHICS PERSPECTIVES

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Overview

- Conservation Philosophy
- Environmental Values Analysis
- Philosophy of Technology

By and large, our present problem is one of attitudes and implements. We are remodeling the Alhambra with a steam-shovel, and we are proud of our yardage. We shall hardly relinquish the shovel, which after all has many good points, but we are in need of gentler and more objective criteria for its successful use.

- Aldo Leopold, *A Sand County Almanac*, 1949
**Conventional Conservation/Management Paradigm**

**Goal:** Conserve species and maintain ecosystems

**Method:** Reduce/undo human impacts
- Limiting human activities in and around habitat/system
- Restrictions on taking
- Breeding and reintroduction programs
- Landscape scale protection
- Ecological restoration

**Justification:** Wide range of values
- Ecological Value
- Instrumental Value
- Cultural Value
- Aesthetic Value
- Organism Value
- Scientific Value
- Natural (or Intrinsic) Value
- Humility
- Intergenerational Justice
The Conservation/Management Dilemma

- More species are at risk and ecosystem changes are accelerating due to non-local factors, shifting background conditions, and macro-scale climatic and ecological change
- Conventional conservation and management strategies – e.g. parks/reserves and historically-oriented ecological restoration – are less effective under these conditions

**Innovation response**: New tools and a willingness to take a more hands-on, interventionist, and design-oriented approach
  - Assisted translocation, rewilding, synthetic biology, gene drives, forest biotechnology

**Why a dilemma?**: The values and goals begin to come apart
  - Naturalness/wildness vs conservation; historicity in restoration vs ecological integrity; challenges to native/nonnative species prioritization
  - This is why forest biotechnology, even if the goal is forest health, is ethically complex and contested
  - It may promote some goals, justified by some values, while posing challenges to others
  - *Case-specific value analysis is crucial*
Core Biotechnology for Forest Health Justification

0. *Forest health (or species conservation) is good/valuable.*
1. Forests are becoming less healthy (or a species is at risk) due to some factor or set of factors (F) - e.g. pathogen, pest, ecological change.
2. Conventional management/conservation approaches and techniques are inadequate for addressing F - e.g. ineffective, costly, slow, or nonexistent.
3. Some biotechnology involved strategy (B) could address F better than conventional approaches - e.g. safer, faster, more effective, lower cost.
4. Therefore, we ought to pursue B to address F.
Koa (*Acacia koa*) in Hawai‘i
0. Forest Health is Good/Valuable

- What is forest health?
  - Fact/normativity issue for scientific/ecological accounts
  - Normative conceptions
  - Different understandings may favor different evaluations of a proposed biotechnology

- Why is forest health valuable (or how does it support other goods/values)?
  - Necessary to evaluate particular biotechnology interventions in particular contexts
  - Not one general answer: different forests, different biotechnologies, different uses/interventions, different operative values
  - *Case-specific value analysis is crucial*
Different Values have Different Logics

- **Cultural Value**
  - Relational to cultural practice; integral to worldview; not substitutable/replaceable

- **Ecological Value**
  - Relational to system; scientifically, not publicly determined

- **Instrumental Value** (e.g. economic, services, resources, recreational, medicinal)
  - Human-dependent; commensurable, fungible and substitutable; not integral

- **Natural (or Intrinsic) Value**
  - Historically contingent; tied to spontaneous and creative ecological and evolutionary processes; not engineeerable

- **Organism Value**
  - Human-independent; welfare/interest-based

- **Intergenerational Justice**
  - Ineluctable responsibility/duty; not substitutable

- **Humility**
  - Attitudinal; recognition of extent of capacities/abilities/knowledge/perspectives

- **Aesthetic Value**
  - Relational to human perspectives

- **Scientific Value**
  - Relational to human knowledge systems
Case-specific Value Analysis is Crucial

- What are the values that are operative in a particular ecological space or with respect to a particular species?
  - Variation among species and forests
- How does the particular biotechnology application (or conservation/management strategy) intersect with those values?
  - Which, if any, values does it promote?
  - Which, if any, values does it undermine?
- Are the relevant values better promoted/protected by the biotechnology intervention than by an alternative form of conservation activity or by less intervention?
Case-specific Value Analysis is Crucial

- Taking the whole range of values, their salience, and the alternatives into account, is the biotechnology application well supported?
  - Acacia koa: No (even if it were more effective and less costly)
  - Bioengineered American Chestnut: Yes?
- **Value analysis is needed in addition to risk assessment (ecological and social), public engagement, and legal, cost-effective, and opportunity cost analyses**

- Product vs Process: If the product (the organisms or system) is the same, does it matter how you got there?
  - It can, depending upon the operative values
Technology as a Form of Life

- Core justification for biotechnology in conservation and ecosystem management conceives of biotechnology as a tool (a means to an end)
- Technologies are also “forms of life”: empowering; perspective altering; worldview revising; practice changing
  - How we understanding ourselves in relation to others
  - How we conceive of and approach problems
  - What we consider to be important
  - How activities/institutions/infrastructure are organized (education, medicine, governance, agriculture, family life, …)
- Novel technologies comprehensively restructure features of the activity they are introduced into
  - Expectations, desires, goals, participants, processes, education/skills needed, infrastructure/materials required, activities involved, meaning…
Conservation Biotechnology as a Form of Life

- Biotechnology in conservation and ecosystem management has the capacity to restructure the nature of conservation
  - Conservation practice and what conservation is (and how it is conceived)
- Conservation biotechnology can fit into the conventional conservation paradigm: mitigating/reducing human impacts
  - Gene drives to eliminate invasive pests
- Conservation biotechnology can help enable a new paradigm: engineering species and systems to better fit into a human-changed world
  - Expands conservation from a focus on addressing ecological and social conditions to adapting species (and forests) to those conditions
  - Raises new conservation possibilities
  - What should the species or population or system be like?
Alternative Paradigm Raises Concerns/Issues

• Does it preserve the value of the species/systems?
• Is it a problematic technofix or moral hazard?
• Does it misidentify the conservation problem?
• Does it perpetuate problematic human control or domination of nature?
• Is it hubristic?
• Does it diminish what constitutes biological conservation – i.e. preservation of the natural evolved biological and ecological world?
• Who has control over decisions/technologies that involve remaking aspects of the biological world?
• Whose is empowered/disempowered?
Conclusions

1. Value analysis is crucial to case-by-case assessment of forest biotechnology applications
   - In addition to risk, costs, and public acceptance
   - Requires sensitivity to the full range of values involved and their particular logics/features
   - Differs by type of technology, application, and ecological context

2. Conservation biotechnology and genomics (including forest biotechnology) has the potential to transform not only conservation practice but the nature of conservation
   - Raises new conservation possibilities, but is also likely to be a source of significant concerns
   - Arises from considering forest biotechnology as such (rather than one off projects)
   - Relevant to evaluating particular types or forms of applications
THANK YOU

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