

# Consortium on Law and Values in Health, Environment & the Life Sciences

## Student Proposal Cover Page

### Applicant Information

Applicant Name: Genya Dana Date: Feb 18, 2008

Project Title: Integrating Social and Natural Science in Ecological Risk Analysis

Department: Fisheries, Wildlife, and Conservation Biology College: Food, Agricultural and Natural Resources Science (CFANS)

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Faculty advisor name: Anne Kapuscinski Email: du  Not applicable

Dept. Head's name: Francesca J. Cuthbert Dept. Head's email: Cuthb001@umn.edu

Dean's name: Al Levine Dean's email: aslevine@umn.edu

How did you hear about this funding opportunity? Major adviser

### Funding

Amount of funding requested: \$2,000

Funding justification: [a clear statement of what you will use the funds for without going into budget details]

Funding will support a small control workshop where I will implement an ecological risk analysis framework with 4 natural scientists. I will compare the results of this control workshop with a larger, stakeholder-driven workshop to test for the effect of stakeholders on ecological risk analysis.

### Approvals

*Check all appropriate approvals required for your proposal. Approvals must be obtained prior to receipt of funding. If you have applied for approval but have not yet received it, indicate that below.*

IRB Date submitted: \_\_\_\_\_ Number: \_\_\_\_\_

IACUC Date submitted: \_\_\_\_\_ Number: \_\_\_\_\_

Other Explain: \_\_\_\_\_

### For Use by the Consortium Office

The proposal is 1000 words or less excluding budget, biographies, references and citations.  
The proposal includes a work plan with a specific timeline using months or quarters to identify work to be done and completion dates.

The proposal includes a 1-2 paragraph biography of the applicant and all co-investigators.  
The budget form is complete including the funds sought for this project, other pending applications for this project, and the amount/source of matching or other funds.

The applicant's faculty advisor is copied on the application email. Professional students w/o advisors check NA.

All necessary approvals are pending or received.

Dana-Consortium Funding proposal

Principal Investigator: Genya Dana, Conservation Biology PhD student

PhD adviser: Anne Kapuscinski, Dept of Fisheries, Wildlife and Conservation Biology

Project Title:

## **Integrating Social and Natural Science in Ecological Risk Analysis**

### **Background**

Many pressing environmental problems, like climate change and biodiversity loss, are caused by a complex mix of biological and social factors. As such problems increase in complexity, practitioners and scholars increasingly recognize that effective management strategies are best developed using a diversity of knowledge types and with the involvement of affected communities<sup>1,2</sup>.

Ecological risk analysis (ERA) determines the likelihood of a harmful event occurring, and the potential consequences of the event<sup>3</sup>. For example, an ERA can investigate the likelihood of a non-native insect species attacking an economically valuable timber forest, and estimate how much damage could result from such an attack. Ecological risk analyses help anticipate environmental problems and provide support for environmental management decisions<sup>4</sup>.

Ecological risk analyses are traditionally conducted by natural scientists with little stakeholder involvement. Such technical analyses fail to engage stakeholders and often overlook experiential knowledge and societal concerns important for understanding the context of environmental problems.

The field of ERA recognizes the need for stakeholder involvement and multiple knowledge types. For example, the National Research Council specifically states that risk assessment should combine analysis of data and non-scientific knowledge with stakeholder deliberation about the information<sup>5</sup>. Such a deliberative, inclusive process should improve the knowledge base, trust and durability of risk-related decisions.

Despite calls for stakeholder involvement in ERA, real world examples are rare. A unique research opportunity exists to test risk analysis methodologies for their ability to incorporate stakeholder deliberation and social and biological information. Such research can also determine if their incorporation improves the quality of an ERA. These questions are important because stakeholder involvement requires additional time and money, and practitioners need to justify the extra effort.

### **Proposed Research**

For my dissertation, I will apply and evaluate a participatory ERA framework which I helped create<sup>6</sup>, using ERA tools I tailored to integrate social and natural science inputs. I have two research questions:

- 1) Can ERA methodologies incorporate diverse knowledge from stakeholders and allow learning between participants?
- 2) Does stakeholder involvement and diverse inputs improve the information base on which to make risk-related decisions?

Risk analysis science and methodologies inform my research; co-editing a book on ERA and minoring in Risk Analysis for Introduced Species and Genotypes trained me in problem formulation, exposure and effect analysis, risk characterization and uncertainty analysis<sup>3,4</sup>. Furthermore, deliberative democracy and social learning theories inform my understanding of the value of stakeholder participation in ERA. Deliberative democratic theory suggests that participants engaged in debate and discussion will update their preferences in light of new information, dialog and claims from fellow participants<sup>7</sup>. Social learning occurs when people engage one another, sharing diverse perspectives and experiences to develop a common framework of understanding and basis for joint action<sup>8</sup>. Deliberation is necessary for social learning, and social learning improves the quality and wisdom of decisions about complex, uncertain and conflict-ridden environmental problems.

### **Research Plan**

I will address my research questions in South Africa, partnering with the South African National Biodiversity Institute (SANBI). South Africa currently farms three genetically modified (GM) crops (cotton, soybeans, and corn), and South Africa's 2004 Biodiversity Act mandates that SANBI monitor GM crops for potential risk to the nation's biodiversity<sup>9</sup>. SANBI, a partner in the University of Minnesota's NSF IGERT grant on ERA, needs a structured way to narrow the focus from "biodiversity" to biologically and socially relevant biodiversity indicators for monitoring. SANBI adopted my participatory ERA framework to structure this process.

My ERA framework incorporates diverse knowledge types and stakeholder involvement during all steps of analysis. I will implement it in a five-day workshop funded and hosted by SANBI. The framework guides systematic analysis of social *and* biological components of a GM cropping system, interactions between components, and likelihood that these interactions will be hazardous. Hazardous interactions will be prioritized by 15-20 stakeholders using social *and* biological criteria. SANBI will use the highest priority interactions to develop biodiversity monitoring endpoints. To address Question #1, I will study ERA methodologies' ability to incorporate social and biological inputs and how stakeholders analyze and deliberate about diverse information.

I will compare the volume and type of information generated from the stakeholder workshop with that generated in a workshop with 4 natural scientists. This small, technical workshop will control for the effect of the process on ERA results. Both workshops will use the same ERA framework and methodologies, and assess the same GM crop. By implementing the same framework, using the same methodologies, with

and without a diversity of stakeholders, I aim to show that stakeholder involvement is responsible for differences in information generated in the two workshops. This addresses Question #2. **I request Consortium funding to support this control workshop.**

### **Innovative Contributions**

- Conduct one of the first real-world tests of how to incorporate both social and biological inputs in ERA.
- Test whether stakeholder involvement, combined with natural and social science inputs, improves the information base on which to make risk-related decisions.
- Build South Africa's capacity to conduct ERA by training scientists in innovative ERA methodologies, thereby strengthening their ability to design biologically and socially relevant environmental policies.

### **Work Plan**

#### Progress to date

- Completed pre-dissertation trip to South Africa (Fall 2007).
- Developed relationships with South African scientists, NGOs, biotechnology industry representatives, and policymakers involved in GM crop farming and regulation.
- Identified important stakeholders and created research partnerships with SANBI and Stellenbosch University's Center for Invasion Biology.

#### Summer 2008

- Move to South Africa.
- Design stakeholder workshop for November, 2008.
- Plan small, control workshop with natural scientists.
- Begin dialog with social scientists, educating them about GM crops and ERA.

#### Fall 2008

- Conduct small, control workshop
- Conduct stakeholder workshop.
- Conduct follow-up interviews for post-workshop data collection.

#### Spring-Summer 2009

- Return to USA, analyze data collected in South Africa.
- Begin writing dissertation.

#### Summer 2009-Winter 2010

- Continue writing dissertation and prepare publications.

#### Spring 2010

- Defend dissertation and continue publication.

### **Biography of principal investigator**

I realized the importance, and difficulty, of integrating social and natural science to solve environmental problems while studying for my masters degree in Science, Technology, and Environmental Policy at the University of Minnesota's Humphrey Institute (completed in 2005). I became especially interested in the concept of risk while working in Geneva, Switzerland on international trade policy. There I observed how the lack of effective engagement between "expert" decision-makers and members of the public hampers acceptance of policy decisions, particularly about technologies the public perceives as risky. An example was the lengthy WTO trade dispute over genetically modified organisms (GMOs). The dispute was fundamentally over scientific and socially perceived risks of GMOs, illustrating that risk assessment underpins many science-based policy decisions. Effective stakeholder involvement offers a way to identify and incorporate non-scientific information and societal concerns in risk assessments informing policy decisions. I began a PhD in Conservation Biology to further develop my understanding and training in stakeholder involvement in conservation decision-making, focusing on ERA of invasive species and introduced genotypes. This program capitalizes on my undergraduate BS in Biology from Emory University and my masters degree in policy.

I developed interdisciplinary training relevant to ERA through coursework, independent study and a preliminary exam focused on communication theory, qualitative social research methods and the social science theories supporting collaborative learning and participatory natural resource management. I pursued these studies in tandem with my work as co-editor, and co-author of two chapters, of a peer-reviewed book on risk assessment methodologies for GMOs (focusing on transgenic fish). I collaborated with some of the world's leading risk analysts and natural and social scientists to develop a new integrated ERA framework informed by the latest scientific techniques in aquatic molecular biology, gene flow assessment, confinement, and monitoring program design<sup>10</sup>. An NSF IGERT traineeship in Risk Analysis of Invasive Species and Introduced Genotypes, and a Conservation Biology Summer Fellowship, supports my research and training in participatory ERA. The skills and knowledge gained from my academic work will prepare me for a career in leading and advising participatory environmental risk analyses, which facilitate scientifically defensible and socially viable policy decisions about environmental management.

## Budget

The budget below is for both dissertation research workshops. The first workshop is the one for which I seek Consortium funding. All amounts are in USD.

<b>Budget for small, control workshop held at SANBI in Pretoria, SA</b>	
Airfare for 1 participant from Capetown*	\$153
Airfare for 1 participant from Bloemfontein*	\$278
Reimbursement for gas and mileage for 1 participant from Potchefstroom** (4 <sup>th</sup> participant lives in Pretoria)	\$110
Lodging: Four nights in medium price guesthouse for 4 people	\$584
Lunch and supper for 4 people for four days (breakfast included in guesthouse fee)	\$234
Supplies and services (e.g., photocopying, creation of workshop packets, internet access) at SANBI (where workshop will be held)	\$50
Honorarium (\$50 per person, for four people, for four days)	\$600
<b>Total budget for small, control workshop</b>	<b>\$2,009</b>
<b>TOTAL REQUESTED FROM CONSORTIUM</b>	<b>\$2,000</b>
<b>Estimated budget for large, 7-day stakeholder workshop convened and funded by SANBI in Pretoria , SA</b>	
Facilitator	\$10,400
Airfare for Genya Dana + facilitator	\$3,000
Travel cost for 18 South African participants (airfare and mileage)	\$2,400
Lodging for 18 participants	\$5,255
Meals for 18 participants	\$2,853
Research supplies	\$500
<b>Total estimated budget for stakeholder workshop</b>	<b>\$24,408</b>

\*Airfare estimated from website [www.farecompare.com](http://www.farecompare.com) for South African flights, converted from SA rand to USD using exchange rate on [www.xe.com](http://www.xe.com).

\*\* Calculated using U of MN standard of 50.5 cents per mile.

## Other Funding

My IGERT traineeship provides my stipend and living expenses while in South Africa. It does not cover research expenses. SANBI is covering the cost of the stakeholder workshop, but I need funding for the small, control workshop. I am also applying for a University of Minnesota Graduate School Thesis Research Grant to fund this workshop, and other research costs (e.g., follow-up interviews after workshops to probe for learning between participants and their reaction to the ERA process).

## References

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- <sup>1</sup> Wondolleck, J. and Yaffee, S. 2000. *Making Collaboration Work: Lessons from Innovation in Natural Resource Management*. Island Press, Washington, D.C., USA.
  - <sup>2</sup> Berkes, F. 2004. Rethinking community-based conservation. *Conservation Biology* 18(3):621-630.
  - <sup>3</sup> EPA. 1998. *Guidelines for Ecological Risk Assessment*. US Environmental Protection Agency, Washington D.C. USA.
  - <sup>4</sup> Burgman, M. 2005. *Risks and Decisions for Conservation and Environmental Management*. Cambridge University Press, Cambridge, UK.
  - <sup>5</sup> NRC (National Research Council). 1996. *Understanding Risk: Informing Decisions in a Democratic Society*. The National Academies Press, Washington, D.C.
  - <sup>6</sup> Hayes, K.R., Kapuscinski, A.R., **Dana**, G., Li, S., and R.H. Devlin. 2007. Introduction to environmental risk assessment for transgenic fish. In: Kapuscinski, A.R., Hayes, K.R. Li, S. and G. Dana (Eds) *Environmental Risk Assessment of Genetically Modified Organisms, Volume 3: Methodologies for Transgenic Fish*. Series Eds. Hallerman, E. and Schei, P. CAB International, Wallingford, UK. p. 1-28.
  - <sup>7</sup> Parkins, J.R. and R.E. Mitchell. 2005. Public participation as public debate: A deliberative turn in natural resource management. *Society and Natural Resources* 18:529-40.
  - <sup>8</sup> Schusler, T.M., Decker, D.J. and M.J. Pfeffer. 2003. Social learning for collaborative natural resource management. *Society & Natural Resources*. 16(4):309-26.
  - <sup>9</sup> National Environmental Management Biodiversity Act (NEMBA). 2004. Parliament of the Republic of South Africa.
  - <sup>10</sup> Kapuscinski, A.R., Hayes, K.R., Li, S. and **Dana**, G (Eds). 2007. *Environmental Risk Assessment of Genetically Modified Organisms, Volume 3: Methodologies for Transgenic Fish*. Series Eds: Hallerman, E. and Schei, P. CAB International, Wallingford, UK.