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Too Much Weed: Invasive Species in Chitwan National Park

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SIT Study Abroad

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Too much weed: invasive species in Chitwan National Park
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Abstract

Invasive plant species threaten jungle eco-systems in Chitwan National Park. *Mikania micrantha* is the most destructive invasive plant in the park and has been named one of the world's 100 worst invaders. It is an exceptionally fast-growing and aggressive perennial plant that is quickly spreading throughout Chitwan and ousting native plant species that comprise the diets of rhinos and other important wildlife species. *M. micrantha* poses both immediate ecological concerns to wildlife and threatens rural subsistence farming populations by destroying cropland. In Nepal, no policy or program exists to contain invasive plant species, and large-scale management of *M. micrantha* is needed in place of current arbitrary management. Before a management program is launched, there is need for increased awareness among park visitors and local people about *M. micrantha*. There is a gap in literature and resources directed at park visitors, so I created educational posters in both English and Nepali to raise awareness about the effects of *M. micrantha*. I distributed the posters to guide services, a hotel, and an orphanage in Sauraha. The aim of my project was to spur a broader awareness campaign about invasives for world travelers and locals in Chitwan as well as discussion about the need for effective invasive plant species management.

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Dr. Current served as my advisor and provided academic and logistical direction for my project.

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Introduction

Mikania micrantha, one of the world's "100 worst invaders," is found in Nepal and is threatening jungle ecosystems (Lowe et. al 2000, 1). *M. micrantha*, (hereafter referred to as mikania) is the most serious invasive species in Chitwan National Park, and its spread is concerning because it is degrading habitat for endangered species like the one-horned rhinoceros and invading cropland. Currently, no large-scale invasive species management campaigns exist in Chitwan, and mikania eradication is still the subject of experiment. Mikania poses serious ecological issues, especially for wildlife, and could potentially have negative social effects, such as crop invasion, on rural villages around Chitwan. For these reasons and the rapid growth of mikania, timely management is essential for constraining its spread. However, public awareness about mikania must be established before serious management is implemented. My project aimed to increase public knowledge of mikania, its effects, how mikania is being addressed, and how the public can help prevent its spread. I worked at the Biodiversity Conservation Center (BCC) in Sauraha, Chitwan, conducting field research and collecting information in order to create educational literature, namely for park visitors. I created posters in English and worked with staff at the BCC to translate the text into Nepali to reach both foreign and local tourists. I composed the posters for laypersons, and distributed them among guide services, a hotel, and one orphanage in Sauraha. The following discussion summarizes background information on mikania, an analysis of my research process and methods, my outcomes, and recommendations for the future.

Background

Commonly known as mile-a-minute-weed or *ban maara* in Nepali, mikania is a perennial creeping plant, native to Central and South America. It spread from India, where it was planted in World War II to camouflage airfields and is now one of the most problematic weeds in South East Asia (ISSG 2005). It was first discovered in Nepal in 1966 and is currently spreading rapidly from east to west through the country (DNPWC 1999). Mikania was seen in Chitwan National Park after a record flood in 1992 and is also spreading westward within the park. Of primary concern is mikania's effect on the threatened one-horned rhino, whose population numbers are already low due to poaching (DNPWC 1999). The invasive plant displaces native species comprising the rhino's diet and reduces the amount of biomass available for grazing. Mikania grows extremely quickly, as much as 9 cm/day, and outcompetes other herbs by more effectively using light, water, and nutrients (Chaudhury 1972). However, mikania is also lethal to large plants and trees because it grows like a mat over large vegetation and smothers the plant from sunlight. Finally, mikania may produce alleopathic chemicals that inhibit the growth of surrounding plants (Ye & Xia 2001). The combination of its aggressive growth characteristics makes mikania management a challenge.

Among the literature on mikania, the focus is divided between its ecological impacts and social implications. In the former category, studies quantify the spread of mikania, which species it affects, and other characteristics of its invasion. I applaud studies by Sapkota (2007) and Murphy et al. (2012) in which empirical data show mikania's negative effect on other plants and rhinos. These published studies also draw practical conclusions about future management

of mikania. The primary efforts include manual and cultural controls such as hand pulling and covering mikania with mulch. Biological controls are also being employed such as the rust pathogen, *Puccinia spegazzini*, which has recently been released and shown positive results in tea plantations in northwest India (Sankaran 2012, Sapkota 2007). Published work on the ecology of mikania was important in the creation of my poster because it lent empirical data with which to support my conclusions in my own educational literature.

In the second category of mikania research, authors articulate the social implications of mikania invasion. Previous research on the social dynamics of mikania invasion emphasizes the need for local action. In fact, locals have expressed their desire and willingness to pay for invasive plant species management, both financially in the time contributions (Rai and Scarborough 2012). Management plans for mikania must include efforts to “control burning, reduce spread and raise awareness about best practice for local resource management by local communities” (Murphy et al, 2012, 6). While the literature highlights the need and importance of local contribution, there lacks a discussion of participation by other entities in Chitwan, namely the government and park visitors and how these entities might play a role in mikania management. The issue of public awareness is limited to rural populations and needs to be expanded to the tourism population which also relies on the park. I agree with the recommendations of Sapkota when he says “Public participation will be an important activity. Public participation in manual removal programs will also remain necessary” (Sapkota 2009, 33). My project builds on his recommendation

by fostering public awareness about mikania management within the tourism industry in Sauraha.

Rationale and Assumptions

Interpretive work related to outdoor tourism interests me, so I developed a project in which my independent study product would be targeted at Chitwan park visitors. My main goal was to increase public awareness, and within this, to educate tourists. I conducted an alternative project because I enjoy the compilation process of making a mixed media product. Instead of a purely anthropological study, an area unfamiliar to me, I chose a research process that I knew I would enjoy and that would result in a usable product for the residents in my study area.

Residents of Chitwan rely on agriculture and tourism to make a living, and the product of scientific research on mikania would be unattainable to them and not easily understood. With that, I aimed for an interesting, relevant, and understandable product for locals, who feel the greatest impacts of mikania infestation, as well as tourists, both foreign and Nepali, who encounter mikania on their park and buffer zone excursions. The month-long ISP period was not long enough to contribute to mikania management, an ambiguous area which is the subject of long-term research, so I chose to work on raising awareness about mikania instead of effecting management.

I initially assumed that I would be able to freely and frequently enter Chitwan National Park and that I would have little trouble finding transportation to my research sites. I also believed that I would be able to identify mikania infestation sites from GIS layers and advice from park wardens. My first

assumption about freely entering the park was disproved when I met with Dr. Maheshwar Dhakal, an ecologist in the Department of National Parks. When he told me that I needed to apply for a research permit in order to conduct my project in the park, I clarified that I would not be collecting samples or setting up equipment. He still seemed apprehensive about the status of my project as research and encouraged me to apply for a permit. I received conflicting information about the need to apply for a permit, and I finally did under the advice of my home institution professor, Dr. Dave Smith, who does research in Nepal. I did not anticipate the lack of clarity in this process and mistakenly believed that parks in Nepal are relatively the same as those in the U.S. That is, I thought there would be many people visiting the park and perhaps trails and activities inside the park. However, Chitwan was established primarily for the purpose of conservation, and villagers were displaced from their homes inside the proposed park in the process to fully render Chitwan a conservation area. Given the strong emphasis on conservation, difficulty of traveling independently in the park, and required daily entry permit, visitation within the park itself is low. The same restrictions and requirements applied to my project, and the low feasibility of entering the park for research led me to relocate my study area to the Baghmara Community Forest. However, this is also a protected area, requiring a research or tourist permit for each entry.

Not only did I not anticipate the permit cost of reaching my research sites, I did not foresee that I would need another permit to interview park wardens. Because the nature of my project resembles scientific research, I learned that access to the government system requires applications and full documentation.

Much of the work I had planned for was “closed off” because of my status as a student researcher and my lack of a permit. While I did apply for a permit, I never heard any response from my email inquiries to the Department of National Parks.

Furthermore, I planned on actively working with staff at the Biodiversity Conservation Center in identifying mikania infestation sites and traveling with them into the park. While the staff were very helpful and treated me with respect, they did not have much time to leave their own commitments to help with my project. Much of my work was self-guided and one of the greatest challenges was trying to continually move forward and adapt my project to newly discovered limitations.

My original plan was to create a field guide to invasive plant species in English and a similar pamphlet in Nepali and make it freely available for tourists at hotels and park entrance points. I modified my plan after talking with Babu Ram Lamichhane, a conservation officer at the BCC, about tourists as my audience. Visitors with little knowledge of botany may not read an entire field guide about invasive species, and they are even more likely to discard the field guide after reading it than keeping it. Further, printing paper copies of field guides would contribute more paper to an area that already faces waste management issues. After Mr. Lamichhane and I discussed posters as an alternative, I adopted this new plan because posters are more practical, viewable, and relevant to visitors. I planned to compose them myself, in both English and Nepali.

Methods

Given the improbability of entering the park as a researcher, I conducted most of my field observations in and around the Biodiversity Conservation Center. Here, I took photos of mikania leaves, flowers, and examples of growth characteristics, made sketches, and took notes for use in my poster. I entered both the park and the Baghmara Community Forest once as a tourist, and walked along the Rapti River in riverine forest, where mikania infestation is highest. My notes and photos from this field visit were important in the composition of my poster and presentation because they demonstrate mikania's growth characteristics.

Using Microsoft Powerpoint, I composed an English poster and started a Nepali version. While I spent many hours working on the Nepali translation and typing in Devanagari, my language skills were not advanced enough to produce publishable quality literature. After seeing my Nepali translation, a field technician advised I work with a translator. Parmanand Gurga, a community development officer at the BCC and a visiting Masters student in botany, Kusum Pokhrel, aided me in translating. They were extremely helpful with technical assistance and providing insight about my poster.

I composed and printed equal numbers of posters in English and Nepali and distributed them to eight different locations within Sauraha. Both English and Nepali posters contained the same sections: introduction to mikania, field characteristics, negative wildlife impacts, future management, and how to help prevent its spread (Figure 1 and Figure 2). I gave an English and Nepali poster to

each of five nature guide services, the Biodiversity Conservation Center, one hotel, and one orphanage.

Mikania micrantha: Invader in Chitwan

What is mikania?

Mikania is an invasive plant species and has been named one of the world's 100 worst invaders. Native to South America, it entered Chitwan around 1992 after a large flood and is spreading from east to west.

Why is mikania a problem?

Mikania is a threat to rhinos because it smothers native plants by stealing light, water, and nutrients. About 20% of rhino habitat in Chitwan has the most severe infestation. Mikania also destroys habitat for deer which are prey for the threatened Bengal tiger. Wildlife may change their habits in response to mikania invasion.



Field Identification

- heart-shaped leaves
- small white flowers
- long viney stem
- grows like a mat over other vegetation and trees




How is the issue being addressed?

Current management is primarily manual. Fire and herbicide treatment are not suitable for Chitwan. Biological controls have not been introduced yet.

Future management depends on:

- community involvement
- introduction of biological controls
- awareness
- grazing by wildlife
- research

What can you do?

- Do not pull mikania because this encourages rapid re-growth from remaining roots.
- After walking in the jungle, clean your shoes and clothes in order to prevent the spread of seeds.



For more information, visit the Biodiversity Conservation Center, Sauraha or <http://apfns.net/factsheet>

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Figure 1. English poster

लहरे बनमारा : Mikania micrantha एक मिचाहा प्रजाति

परिचय
लहरे बनमारा विश्वको १०० वटा अति खराब मिचाहा प्रजाति मध्येको एक र चितवनको प्रमुख मिचाहा बनस्पति हो। दक्षिण अमेरिकामा स्थानीय प्रजातिको रूपमा रहेको यो प्रजाति चितवनमा सन् १९९२ मा आएको ठूलो बाढीसँगै फैलान थालेको थियो। यो प्रजाति नेपालमा पूर्व देखि पश्चिमतर्फ फैलिदै गइरहेको छ।

पाइने क्षेत्र
मिमसारको छेउछाड, ओसिलो वन तथा बाँसै मैदान, बारको छेउछाड।

पहिचान

- मुटुजस्तो आकारका पातहरू
- बामो लहरा
- सानो आकारको सेतो फूल
- फूल फुल्ने समय
- अरु बन्स्पती र रुखहरूमा मान्द्रो जसरि फैलने

बनमाराले पार्ने प्रभावहरू

- ठूलो एकसिंगे गैँडा लगायत अन्य वन्यजन्तुको जस्तै भृगको वासस्थानलाई बिगार्दछ जुन सन्कटापन्न पाटे बाघको गिकार हो।
- गैँडा लगायतको वन्यजन्तुको आहारा क्षेत्र घट्दै जाने।
- चितवनमा गैँडाको २० प्रतिशत वासस्थानमा प्रचुर मात्रामा फैलिएको।
- वन्यजन्तुले आफ्नो वासस्थान परिवर्तन गर्ने।

व्यवस्थापनका उपायहरू

- जैविक प्रविधिको अवलम्बन गर्ने
- अनुसन्धान गरि दिग्दर्शन तयार गर्ने
- समुदायको सहभागिता बढाउने
- जनचेतना फैलाउने
- वन्यजन्तुद्वारा चरीचरन
- जरा देखि उखाल्ने
- आगो नबगाउने

कसरी मदत गर्ने

- लहरे बनमारा तान्हुदैन।
- बिउहरु छरिन नदिन वनमा हिंडेपछि लुगा र जुत्ताहरू सफा गर्नुपर्छ।

थप जानकारीको लागि Biodiversity Conservation Center, सौराहा

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Figure 2. Nepali poster

Results and Findings

Field observations from within the park and the buffer zone show that mikania infestation is most severe in grassland and riparian areas. Mikania grows in dense mats over other vegetation along the banks of the Rapti River (Figure 3) and the surrounding riverine forest (Figure 4). Likewise, grassland areas are heavily affected (Figure 5).



Figure 3. Heavy mikania infestation along the banks of the Rapti River, 5 km north of Sauraha, evident by the light green leaves and white flowers.



Figure 4. Mat-like growth of mikania along Rapti River, 5 km north of Sauraha



Figure 5. Mikania infestation in grassland area within Chitwan National Park

Grassland is the most preferred habitat for rhinos, followed by riverine forest, and in one survey, 73% of rhinos were found in these habitats (DNPWC 1999). The same study found that riverine forests were most heavily infested with mikania, and tall grassland showed the third largest magnitude of invasion. Second only to poaching, habitat degradation from mikania is the largest threat to rhino populations. The ease of seeing wildlife like the one-horned rhino draws visitors to Chitwan National Park. For this reason and in order to make the issue of mikania more relevant and interesting to visitors, I highlighted rhinos in my poster.

In addition to park visitors, I intended to reach Chitwan locals because they directly experience the negative effects of mikania. The residents of Sauraha and surrounding area with whom I spoke did know about mikania or *ban maara*

and its harmful impacts. All but one family I spoke with lived in Sauraha, and I did not visit villagers in the Baghmara Community Forest. Most identified mikania as a weed, but did not articulate specifically its negative effects and how it is being managed. Each respondent's knowledge of mikania varied, and it is my intent that Sauraha residents can also benefit from seeing the posters. If I had had more time and resources, I would have studied the social effects of mikania and conducted interviews with Sauraha residents and community forest residents in order to inform mikania management strategies.

While no park wide initiatives currently exist, rural farmers have expressed willingness to pay in cash and labor contributions for forest management (Rai & Scarborough 2012). Such management would necessarily have to be oriented within villagers' use of park resources. Once a year for about three weeks, community forest residents are allowed park entry to collect firewood and fodder. During this time, they also burn portions of grassland in order to encourage vigorous re-growth of grass for livestock. Had I been able to obtain a research permit to enter the park itself, I would have visited these sites to see if mikania colonizes after burning. Because no active management is currently taking place, I proscribed my own predictions about future management in my poster.

Discussion

Because invasive plant species have both positive and negative aspects, management is challenging. The issue is further confounded by a lack of institutional support. Currently, there is no policy or program within Nepal to reduce the spread of invasive plant species, and future management is ambiguous, especially regarding the burden of costs. Rural populations bear the greatest costs

of invasive plant species because invasives compromise the rural subsistence activities that people rely on to survive (Rai and Scarborough 2012). For example, Baghmara Community Forest residents may face increased crop destruction from wildlife if the park is losing biomass from mikania. Wildlife may then changes their grazing patterns and migrate to areas with greater sources of food, including farms. Additionally, mikania may destroy community members' farms, forcing farmers to relocate their fields farther from their home, purchase new land, or abandon farming.

In this context, rural populations' investment is essential for successful invasive species management around Chitwan. Public awareness on invasive species management is an important means of garnering public support for the management process. The degree to which my posters are "public" is limited to the town of Sauraha, and will most likely to be viewed by Sauraha residents and park visitors. Realistically, rural villagers are unlikely to frequent the businesses where I distributed posters, so my aim of public awareness and engagement is limited to a small area. However, my posters may induce a larger awareness campaign within the Chitwan and internationally if foreign park visitors convey the issue in their home countries. It is also my hope that the posters induce discussions of the need for invasive species management projects and government policy to prevent the spread of mikania to other protected areas like Bardia National Park. While it is unlikely that my project will effect policy change, I anticipate that it will spur discussions about future direction and needs.

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