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CONTENTS:

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Exploratory GIS modelling for assessing potential conflict in Australia's central desert region

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Abstract: This paper presents a simple methodology (preliminary and exploratory) to model potential hotspots of land-users' conflict at regional level in preparation of a dispute system design. Australia's central desert region is chosen and modelled in terms of four independent variables - Aboriginal communities, National Parks land, Pastoral lease and Tourism site, and one dependent variable - Strength of Interest. Preparation of the data is detailed in nine steps. Analysis takes place in two forms: overlays and statistical summary. Overlaying two coverages reveals potential conflict by demonstrating which interests have overlapping zones of interest. These zones are divided into areas of Strong, Medium, Weak and No Interest. Three insights from this method of analysis are discussed. Simple statistical summarization describes the conflict potential from the perspective of each respective group of interests and two insights are discussed. An unexpected insight was gained through this process showing potential conflict within groups of interest as well. Through this modelling exercise it is determined that a simple GIS application can produce significant insights in preparing a dispute systems design.

Keywords: Conflict Assessment, Geographic Information Systems, Conflict Modelling, Australia

1. Introduction

An enormous amount of current work in peace and conflict studies focuses on convincing parties in dispute to consider alternatives to resolving their disputes in ways other than structural or overt violence (Bercovitch 2002; Bingham 2004; Bush and Folger 1994; Freeman 1995; Lederach and Wehr 1991). But this post hoc approach to conflict may be problematic in requiring huge resource expenditures in terms of money, time and human capital (Bush and Folger 1994). Efforts to mitigate the high costs of choosing a non-violent approach to resolving disputes are numerous and growing, seeking "proactive measures to identify the source of conflict before it intensifies into an intractable situation" (Wondolleck and Yaffee 2000 quoted in Brody, et al. 2004, 122) that will "provide a means for the parties to put out the brush fires before they escalate into bushfires" (Street 1994, 185).

Broadly presented, this paper seeks to model the implementation of a simple geographic information system (GIS) to undertake the first step in designing any conflict resolution process—the conflict assessment (Elliott, et al. 2003). The GIS model highlights "potential hotspots of stakeholder conflict" and uses these findings "to guide future management decisions, not to develop…specific design requirements" (Brody, et al. 2004, 14). This study purposefully uses one of the simplest seeks to model these hotspots in a graphical manner

that may be easily interpreted by those involved in a dispute, allowing them a greater chance of choosing how to respond.

Geographic information systems and maps are "inherently well suited to facilitating collaboration among human participants in thinking and decision-making about the geographic-scale environment" (MacEachren 2000: 445) and thus have become increasingly important tools in conflict assessment and management. For example, Jones (2004) reports on the use by several communities neighbouring the Lumbombo Transfrontier Conservation Area in South Africa of a community-integrated GIS "to contextualise local resource decisions within the global conservation framework" (p. 1). Tripathi and Bhattarya (2004) summarize efforts to integrate GIS and indigenous knowledge for natural resource management, Godschalk, et al. (1992) applied a GIS model to assist in resolution of planning disputes, and Rimbaldi and Callosa-Tarr (2002) have created a three-dimensional, non-computer dependent GIS kit to assist in analysis and decision-making around resource use. Elix and Lambert (2007) map values to resolve land use conflict around shorebird habitats in Tasmania. And with objectives similar to those proposed in this paper, Brody, et al. (2004) used a GIS to map dispute potential in coastal Texas.

Through this model, this paper seeks to answer the question, "Can a geographic information system be used to assess potential conflict between interests at the regional level? The decision was made to use a GIS as it allows one to compare several, complex variables representing various aspects of natural resource use interest. A GIS can do this by incorporating multiple variables or data sets into layers of a map that are then compared to one another or combined into one whole representation of the data set.

Before advancing any further, a few potential dangers accompanying regional conflict modelling should be identified. Firstly, modelling, by design, presents a simplified version of the infinite variability of the actual world. This study is no exception. In expounding a heuristic model to conflict assessment it does not suggest that that regional conflict is wholly characterized by spatial interests, for this would be clearly inadequate without considering the important role culture, values and ideologies play in determining conflict relationships. Secondly, given that models are simplified versions of reality, a policymaker relying too heavily upon the results of this model could easily make an interpretation that negatively impacts conflict and groups in the region. Therefore, someone familiar with the region and its socio-cultural dynamics would be best placed to interpret what the model presents.

2. Description of experimental site

The central deserts region of Australia is chosen as the site for this study in response to the Desert Knowledge-Collaborative Research Centre's call for research to augment their efforts in economic development of the region. Much of the economic activities of the region are limited to those related to the land: mining, tourism and pastoralism. (DK-CRC 2005). It is a sparsely inhabited region with a rapidly growing Indigenous population and stagnant growth rates among the non-Indigenous populace. Destabilizing differences exist between Indigenous and non-Indigenous, including widely disparate employment rates, unequal access to health care and a large gap in educational attainment (DK-CRC 2005). These differences combined with a history of government oppression of Indigenous populations (Roberts 2005; van Krieken 1999) provide an ideal setting for studies of proactive conflict assessment.

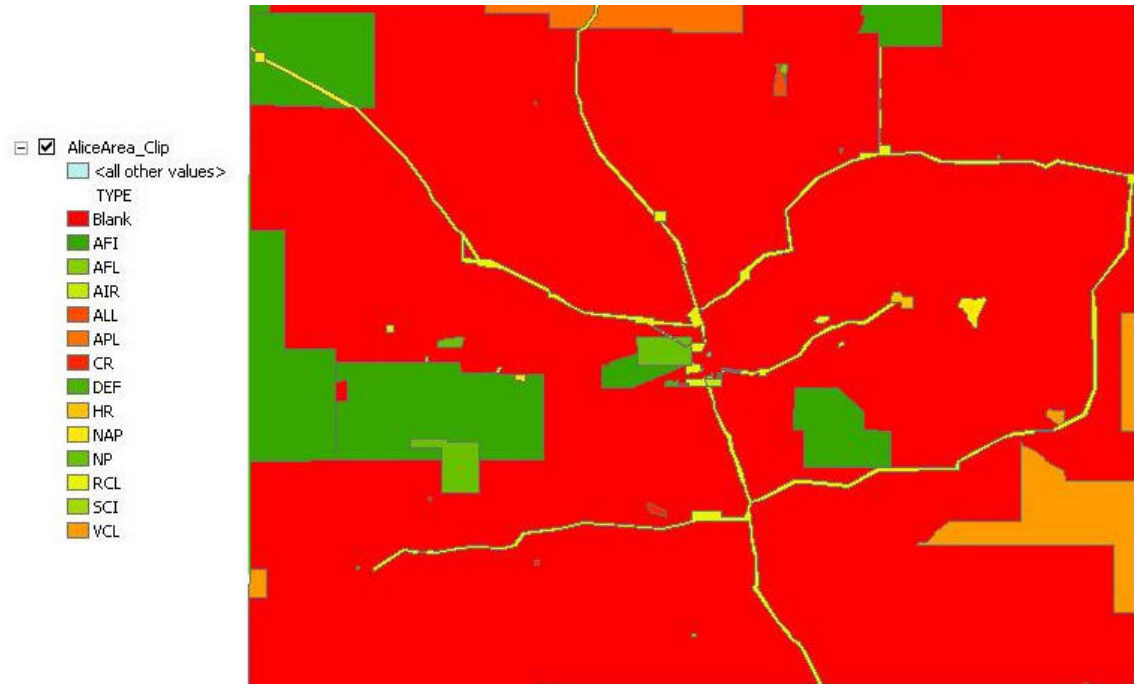

Figure 1 - Study Area

2.1 Variables

Four independent variables and one dependent variable are explored in this model. The four independent variables represent groups of similar interest, which are **Aboriginal** communities, **National Parks** land, **Pastoral** lease and **Tourism** site. The dependent variable is the **Strength of Interest** each independent variable has in a particular area. All independent variables were derived from NPAL (National Public and Aboriginal Land 2004) coverage using ESRI's ArcMap as the GIS tool. As this data set contains a more detailed system of classification than was needed for this experiment, five general groups of four variables and an open or miscellaneous group were generated from the plethora available.

The **Aboriginal** variable is made of the coverages for inalienable Aboriginal Freehold Land, alienable Aboriginal Freehold Land, and Aboriginal held lease. **National Parks** includes coverages for Conservation Reserves, Historical Reserves, Nature Park, National Park and a Scientific Reserve. As there was only one pastoral lease from the NPAL data set in the study area, the **Pastoral** variable included only one case, Aboriginal held pastoral lease. Although this case is also Aboriginal and could therefore be included in the **Aboriginal** variable grouping, an Aboriginal pastoral lease is sufficiently specific in its strategies and interests to merit its own classification. **Tourism** does not equate to tourists; it represents tourist interest groups (i.e. Northern Territory Tourist Board, hotels, guided tours, etc. The **Tourism** variable is the Alice Springs Airport. All the other coverages (Blank, Defense Reserve, Reserved Crown Land and Vacant Crown Land) in the study area were collapsed into an **Open** grouping to facilitate their exclusion from the model.

Two other interest groups (Mining and Military) play roles in the economic development of Australia's central deserts region but were not included in this modelling exercise. While mining is an important economic factor and its influence is felt all across the region, no active mining sites lie within the study area as defined below, therefore mining was impossible to include in the model. The Australian military also has a recognizable presence in the region, but for the purposes of this model it is seen as an exogenous interest group, or one that represents the power of the Commonwealth. As such military zones enjoy a special

status that generally exempts them from considering only regional interests in resolving any conflict in interests that may arise between them and the other interest groups.

Variable	Original Coverages	Acronym
Aboriginal	Aboriginal Freehold Land (inalienable)	AFI
	Aboriginal Freehold Land (alienable)	AFL
	Aboriginal held lease	ALL
National Parks	Conservation Reserve	CR
	Historical Reserve	HR
	Nature Park	NAP
	National Park	NP
	Scientific Reserve	SCI
Pastoral	Aboriginal held pastoral lease	APL
Tourism	Alice Springs Airport	AIR
Open	Blank	--
	Defense Reserve	DEF
	Reserved Crown Land	RCL
	Vacant Crown Land	VCL

Table 1 - Composition of Independent Variables and Open Variables including Original Coverages and their Acronyms.

The creation of these four variables yielded a total of thirty-five separate polygons in the GIS database that represent individual origins of interest or 'cases'[i]. The dependent variable, **Strength of Interest**, uses distance from the origin of interest (whether centre point or polygon boundaries) to represent the strength of interest each case has in an area. The assumption was made that strength of interest in a particular area diminishes linearly as the distance from an individual case increases[ii]. Therefore, these zones of interest were arbitrarily classified into three equal zones of approximately 31.5 linear kilometres, each representing a zone of strong, medium or weak interest. An additional zone of 'no interest' was designated to include all areas beyond 94.5 kilometres from the origin of interest.

3. Data preparation

Preparation of the data for analysis took place in nine steps.

1. Data collection
2. Creation of cross-interest matrix
3. Creation of study area map
4. Recoding of type field
5. Merging of polygons
6. Dissolving of open-coded areas
7. Creation of separate independent variable shapefiles
8. Calculation of centroids
9. Calculation of Euclidean distance layers

Data collection was the first step in preparing for this conflict analysis model. The data for analysis were collected from an interview with the director of the Northern Territory Tourist Commission southern regional office (Harkin 2005) and a brief literature review (NTTC 2005; Schulz 1999; Corbett, et al. 1998). The focus of this cursory research was to determine what, if any, general interests each of the four experimental groups in Central Australia would have in relation to each other.

In step 2, these individual interests in relation to the other groups were placed in a cross-interest matrix to allow for a preliminary analysis of connections between them (see Appendix I: Original Interest Matrix). The matrix revealed that not all interest groups have an interest in all of the others. Unexpectedly, in this case, no interests were found between the National Park and Pastoral groups. This is a significant find, in that this was not seen until this analysis and it permits important questions to be raised at an early stage of the assessment design. In this case, such a lacuna does not seem indicative of actual relationships between natural resource interest groups in Central Australia, rather it most likely represents a hole in the original research that could be easily filled in future research by a focused literature review or a specific question in an interview with representatives of the concerned interest groups.

However surprising, this lack of data does not undermine the validity or strength of this exercise, for the interest matrix does not contribute data directly to the model. The purpose of the interest matrix was not to identify relating interests between each and every interest group. It was to determine what, if any, significant interests existed between the dependent variable groups. The interests both Pastoral and National Parks have in relation with the other groups are deemed sufficient to keep them both in the model.

Because the NPAL map included information well beyond the scope of this model, an area around Alice Springs was clipped out as step 3, yielding a study area of about 391.7 km by 323.9 km called AliceArea_Clip.

For step 4, in the attribute table accompanying this new study area, a new field called Interest was created. This is the field in which all the polygons were coded to fit within the four hypothesized interests plus one open interest field (a sort of miscellaneous or catch-all code). Within the original attribute table, the Type field was used to recode the Interest field. All types of AFI, AFL, and ALL were recoded A (**Aboriginal**); CR, HR, NAP, NP and SCI were recoded N (**National Parks**); APL were recoded P (**Pastoral**); AIR were recoded T (**Tourism**) and Blank, DEF, RCL and VCL were recoded O (Open)[iii].

RE	NAME	TYPE	Interest
			O
	NORTH WEST STOCK ROUTE	RCL	O
			O
	NORTH SOUTH STOCK ROUTE	RCL	O
	ANGARAPA	AFI	A
	TI-TREE ABOR PASTORAL LS	APL	P
	YUENDUMU	AFI	A
	TI-TREE ABOR PASTORAL LS	APL	P
	YALPIRAKINU (MT.ALLAN)	AFI	A
	YALPIRAKINU (MT.ALLAN)	AFI	A
	SOUTHERN STOCK ROUTE	RCL	O
	BOUNDARY BORE	RCL	O
	ANGULA	ALL	A
	ANGULA	AFL	A
	ANNAS RESERVOIR	CR	N
			O

Figure 2 - Recode of Type Field into Interest

Step 5 was to merge those polygons that represented parts of the same entity yet were divided in the GIS map by a road or some other feature in order to allow them to be considered one unit in future analyses such as area and centroid calculations. For example,

the Aboriginal Interest Group of Yalpirakinu (Mt. Allan) in the far northwest corner of the study area is represented as two polygons, bisected by a road.

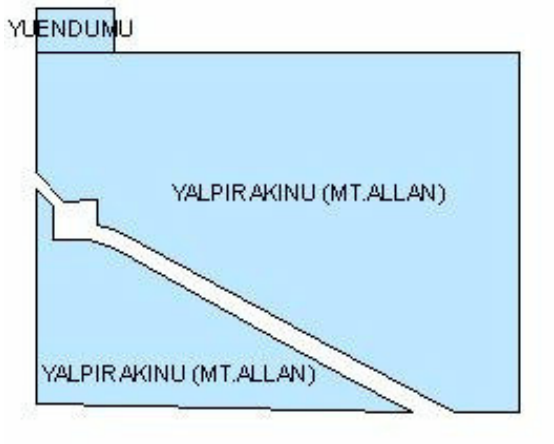

Figure 3 - Yalpirakinu Polygons Separated by Road

Next, in step 6, all areas that were classified as Open were merged into one by erasing their names and then dissolving by the Name field. This was accomplished through the Dissolve tool in ArcMap having the statistical output to be the sum of the area for each dissolved polygon yielding the map coverage 'AA_Dissolve'. A field was added to this dissolved coverage's table called 'Interest' which was manually coded the same as the Interest field in AliceArea_Clip.

Attributes of AA_Dissolve

NAME	Interest
	O
ALCOOTA EXC.	A
ALICE SPRINGS AIRPORT	T
ALICE SPRINGS TELEG STN	N
AMOONGUNA	A
ANGARAPA	A
ANGULA	A
ANNAS RESERVOIR	N
ARLTUNGA	N
CHAMBERS PILLAR	N
ELLERY CREEK BIG HOLE	N
EMILY AND JESSIE GAPS	N
FINKE GORGE	N
GLEN HELEN GORGE	N
HAASTS BLUFF	A
HENBURY METEORITES	N
HERMANNSBURG	A
ILLAMURTA SPRINGS	N
IRRERLIRRE	A
MUPATAKA	A

Figure 4 - AA_Dissolve coverage showing recoded interests and merged open field

This dissolved coverage was then reclassified according to the interest field with the Open class left hollow (no colour), looking thus:

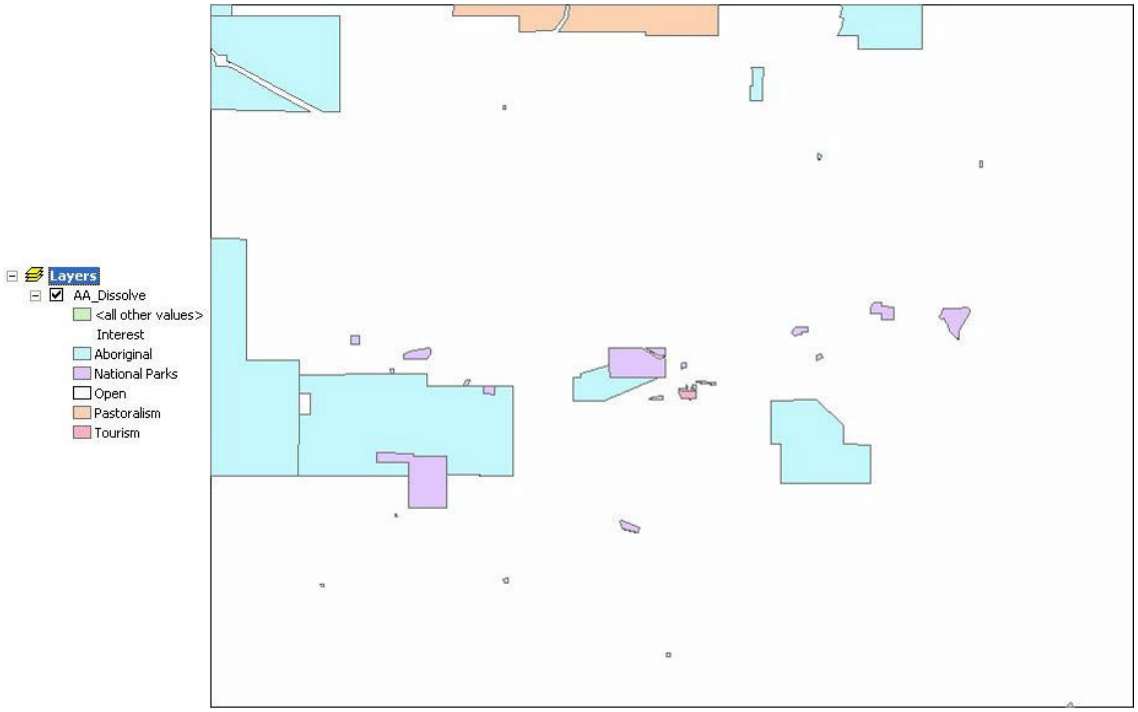

Figure 5 - View of classified interest groups

The seventh step was to separate each interest into its own shapefile with the attendant centroid coordinates. This was done in ArcMap by selecting each interest from the table and then creating a layer from the selected polygons. These layers were exported as shapefiles and then added to the view. For example, the Aboriginal interest group looks like this:

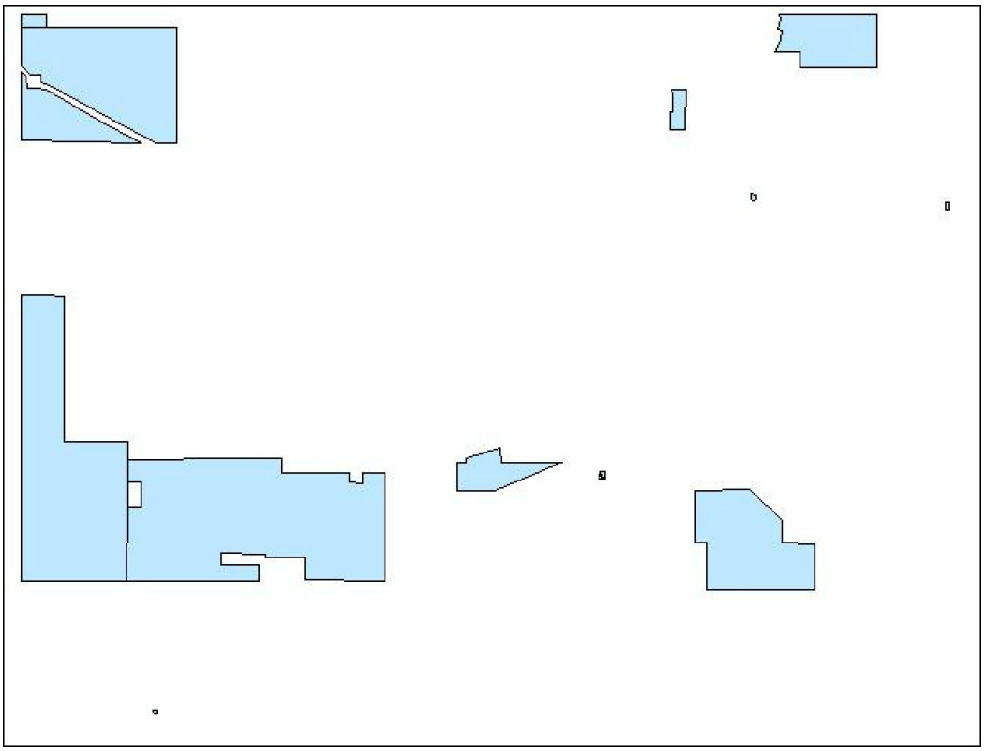

Figure 6 - Aboriginal interest group layer

Step 8 in the data preparation stage was the calculation of centroids. The centre point for each polygon was calculated to facilitate some of the distance calculations in the next step. This was done by importing each database file to Excel, deleting everything except the X and Y values fields, saving this new table as a new Database IV file (e.g. Aboriginal_CC.dbf) and importing them back into ARCMap through the 'Add XY Data' tool. In Figure 7, a layer of the centroids for Aboriginal_Interest is superimposed over the Aboriginal_Interest polygon layer.

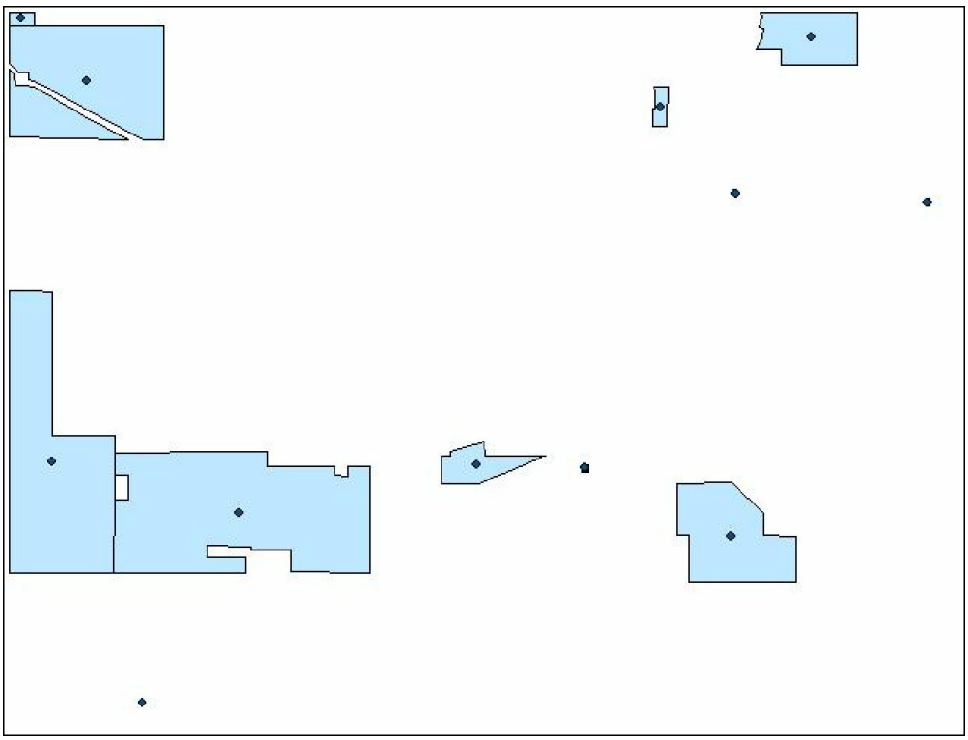

Figure 7 - Aboriginal interest and centroid layers

In the final step, Euclidean distance layers for each interest group were created. As presented above, distance was chosen as a proxy for the strength of interest of a group over an area. Each distance layer was coded into three zones of equal width. The distance limit was set at 100km and the intervals were for about 31.5km (approximately 0.292767183 degrees of longitude at the latitude of Alice Springs). Each distance raster was first, reclassified from floating point to integer raster and then converted to a shapefile. The 30 km zones of interest were reclassified from Strong Interest (0-31.5km) to No Interest (94.5km and more) away from each of the area centroids or polygon boundaries. For example, the zones of interest for labelled Aboriginal communities[iv] are represented in Figure 8.

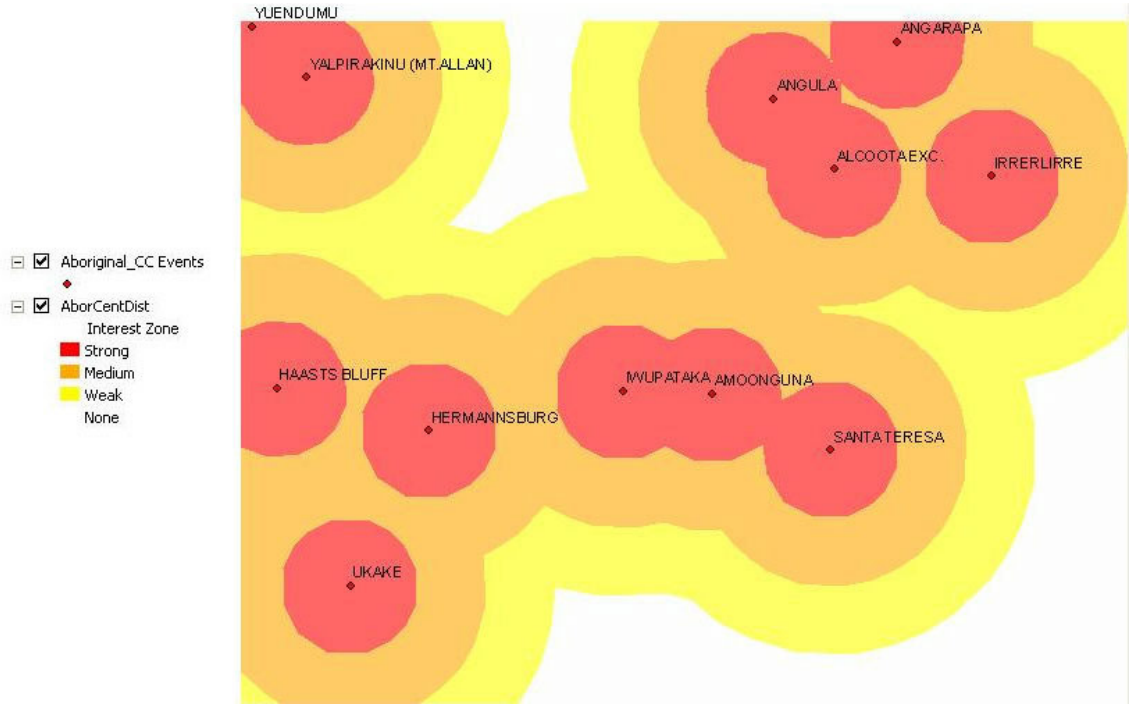

Figure 8 - Aboriginal zones of interest

The dark red area covers the zone of Strong Interest for each particular Aboriginal community. The orange is the zone of Medium Interest and the yellow denotes Weak Interest. No colour indicates no interest.

Before these layers could be created, a decision needed to be made concerning the base shape from which the distances would be calculated. In this model there are two primary shapes related to each interest group: point and polygon. Therefore, a choice was made for each interest group between polygon shape and centroid as the basis for calculation. It was decided that two interest groups (Aboriginal and Tourism) would have distance calculated from their centroids while the other two (National Parks and Pastoralism) would have distance calculated from their polygon.

In order to make this choice it was necessary to hearken back to the definition of the independent variables represented by the polygons. The Alice Springs Airport represents the Tourism variable, which as an interest group has interest in other lands, but is not necessarily defined by any particular spatial extent. Thus a centroid-based calculation works as it signifies the centre of interest for tourism-based entities. For the Aboriginal variable, a centroid was chosen because the level of analysis was community interest, not land interest. Therefore a centroid will best represent a common centre of interest of the Aboriginal community.

A polygon-based distance calculation was chosen for National Parks and Pastoralism interests because in both these groups the extent of their land is an immediate and defining interest for themselves as well as in attracting the interest of other groups. For example, the western pastures of a pastoral lease are more attractive to an Aboriginal community located to the West of the lease than are the lease's eastern pastures. The same generalized relationship can be made for an East-located Aboriginal community and eastern pastures. Thus, the extent of the lease is an important factor in determining its zone of interest in relation to the other groups.

At first view this important conceptual difference between distance calculations from centroids or polygon boundaries did not seem to carry over into the mapping for the National Parks variable. In Figure 9, the centroid-calculated zones are superimposed over the

boundary-calculated zones. At this scale, to the eye unfamiliar with comparison between layers there does not seem to be much more area covered by the boundary-calculated zones than the centroid-calculated.

But further statistical analysis revealed that this perception was deceiving, particularly in the case of Finke Gorge and Illamurta Springs, as will be discussed below in the section on the conflict matrix.

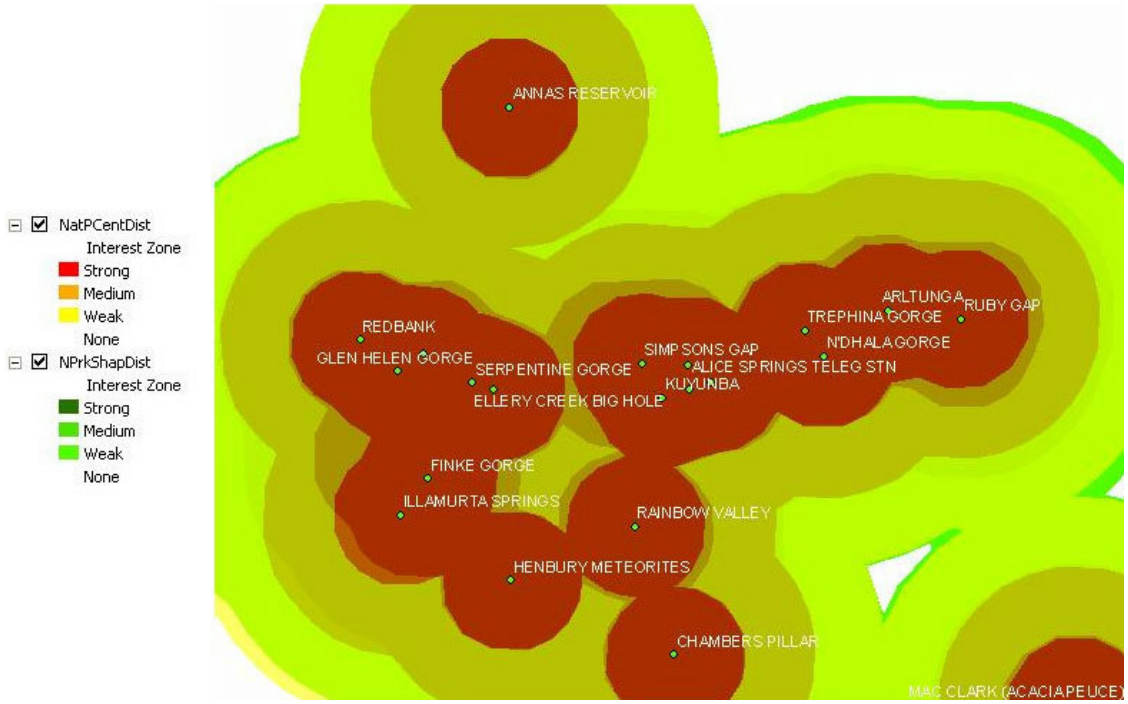

Figure 9 - Centroid-calculated zones of interest overlaying boundary-calculated zones for National Parks interest groups

4. Data analysis and interpretation

So far we have only looked at one interest group's zones of interest without examining any of the potential interaction these interests may have with others. The purpose of creating each layer of interest was to be able to compare each layer with any combination of the others. This model just analysed the relationship between two interest groups at a time. The analysis occurred in two formats. The first format was the overlaying process touched upon above. The second format was through a conflict matrix. In the first format, two interest groups were viewed simultaneously to represent in an intuitive manner how their zones of interests relate. The interaction between the two interest groups centres on the zones of strong interest (darkest colours), from the perspective of one particular zone at a time and represents the amount of motivating force for action is generated. For example, if one group's (Interest A) zone of strong interest touches upon another group's (Interest B) zone of strong interest, then this was viewed as a very strong competing interest area and lots of energy between the two will be generated. Intensity of competing interest for A decreased as distance increases. Thus, if Interest A's zone of medium interest touches upon B's zone of strong interest (A's orange to B's green) then for A this is a less competing interest setting. The interest for A lessens even more if its zone of weak interest were to touch upon B's zone of strong interest (A's yellow to B's green).

For example, in Figure 10, Aboriginal and Pastoral interests are compared. It can be quickly apprehended that seven of the twelve Aboriginal communities have little or nothing to do with the interests of Ti-Tree Pastoral Lease. But five[v] express an active overlapping of

interests. Of the five, the Pastoralism interest encroaches upon Angula's zone of strong interest (green touches red). Pastoralism's zone of medium interest touches the strong interest zone of Alcoota, Anarapa, and Yalpirakinu, while its weak interest touches Yuendumu's strong zone.

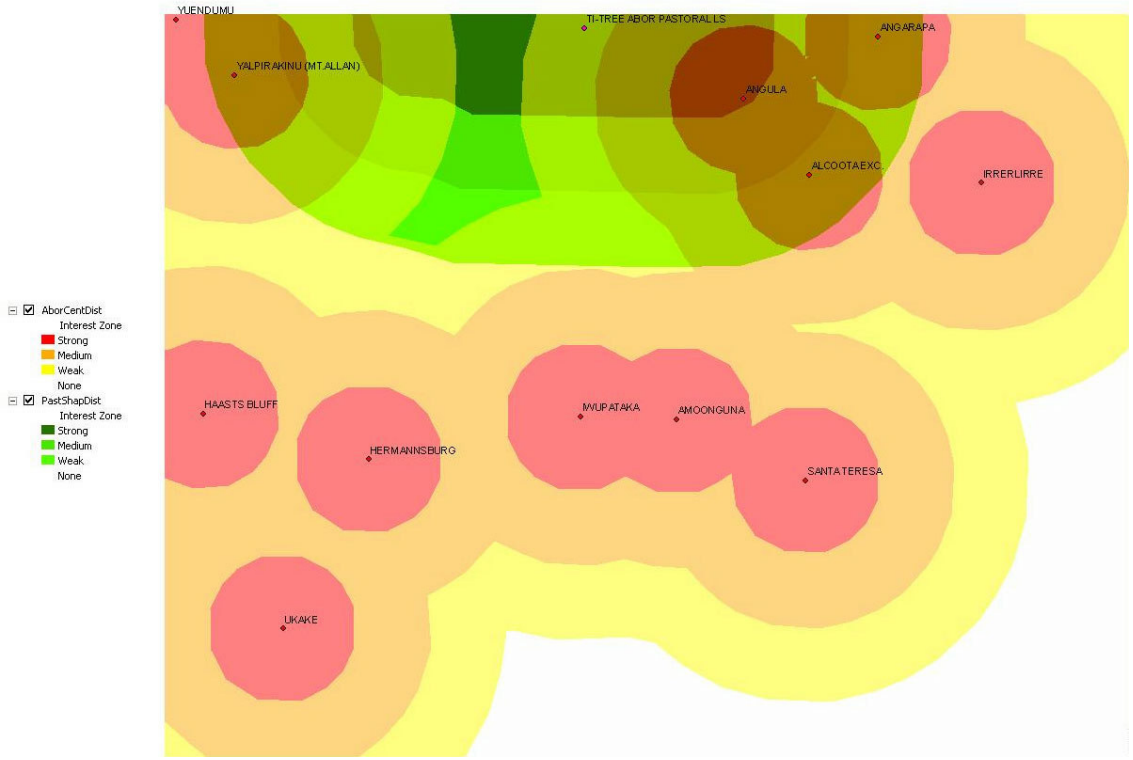

Figure 10 - Aboriginal zones of interest overlaying pastoralism zones

Several insights into and benefits for the conflict setting can be quickly gleaned from this simple analysis for the dispute designer knowledgeable about the region. First, an immediate grasp is made of the nature and strength of certain interests from the perspectives of both parties in conflict. For example, the pastoral lessors might be more interested in resolving a conflict with the Angula community than with the other four, simply because their strong interests coincide. But the other four communities may feel as strong about their strong interests being touched upon and therefore insist on pursuing a conflict. On the other hand, because only the medium and weak interests touch upon the strong interests of the other four communities, a settlement or collaborative approach might be more easily achieved because the pastoralism interests are not as important.

Second, many options to resolving competing interests become more apparent such as implementing a interests, rights and power structure (Ury, et al. 1990) to resolutions in accordance with the weak, medium and strong gradient. Or one could implement a structure of facilitating face-to-face negotiations over the weak area of interest, mediation in the medium zone and arbitration in the strong zones.

Third, a dispute resolution designer would quickly see that not all Aboriginal communities have the same interests as other Aboriginal communities. Ukake may not have any connection to or understanding for Angula's competing interests with the pastoral lease. Thus, the same amount of resources that may have originally been slated for the entire region could be maximized through efforts on focusing communication and resolution between pastoral lessors and five communities instead of twelve. Finally, this format provides a good opportunity and the means of expressing another's views and interests in a less-threatening manner.

The second format of analysis is through statistical summary, which can be done in two steps. This first step of statistical analysis is through a conflict matrix, this one being more detailed than the original interest matrix presented in Table 1 in that this time all thirty-five of the cases are compared to each other creating a total of 1225 possible interactions. The original study design called for more dependent variables than just distance, but it became quickly evident that for the sake of a preliminary, exploratory model such as this, the number of permutations would be unwieldy. In due order, the focus was narrowed to just the distance variable, but other useful variables are discussed below in the recommendations section.

Appendix III contains the entire conflict matrix based upon the distance model. Table 2 summarizes the matrix through an expression of the conflict score for each case, which is an indicator of the magnitude of competing interests experienced by one interest in relation to the other thirty-four in the region. Each encounter between cases was scored 0, 1, 2, or 3. A zero score indicates no zone of interest touched the zone of strong interest of any other case. A score of 1 indicates a weak conflict setting where the weak zone of interest of one case touched the strong zone of interest of another case. This coding continued thusly until the highest conflict setting occurred in which the strong interest zone of one case touched the strong interest zone of another, earning a score of 3.

The above analysis could be extended by also tracking the matches between medium and medium zones of interest as well as weak and weak zones. This would express the conflict from both parties simultaneously. By comparing the strong, medium and weak zones of interest only to the strong zone of interest of another party, the conflict is viewed primarily from the perspective of one party at a time. This becomes a particularly practical characteristic when comparing these layers in the presence of stakeholders in the conflict, improving their ability to quickly grasp the conflict from another's point of view.

The scores for a particular case's encounters with all others were then summed. The higher the resulting score, the greater the potential number of conflict settings encountered and/or the greater the potential intensity of these conflicting encounters. Thus, referring to Table 2, Mac Clark, a national park area, is in very little potential conflict with any of the other areas in the Alice Springs region. On the other hand, relative to the others, Iwupataka and Simpsons Gap both express a high number of competing interests with many of the other interests and therefore express a greater likelihood of entering into a number of conflicting relationships in the future.

A conflict matrix, like overlaying the maps, provides a number of quick insights that could guide a dispute system designer. Most glaringly is the disparity between conflict settings. Referring to Table 2, it becomes apparent that Iwupataka, an Aboriginal community, and Simpsons Gap, a national park area, have a relatively high conflict potential. With this information, regional development initiatives can be directed their way to expand the pool of resources or provide other options to satisfy their interests in relation to other competing entities.

Second, a conflict matrix shows that despite the apparent similarity between interest zones illustrated in Figure 9, observations based on calculations from interest boundaries do reveal a greater disparity of conflict potential between cases. For example, Finke Gorge and Illamurta Springs are both natural park areas located in close proximity one to another. But because Finke Gorge is quite a bit larger than Illamurta Springs it shows a 59% greater propensity for conflicting settings than Illamurta Springs. Finally, any case can be quickly compared to another to determine the conflict score for that particular encounter.

Case Name	Conflict Score
IWUPATAKA	48
SIMPSONS GAP	48
KUYUNBA	46
ALICE SPRINGS TELEG STN	44
ELLERY CREEK BIG HOLE	44
EMILY AND JESSIE GAPS	44
ALICE SPRINGS AIRPORT	43
FINKE GORGE	43
SERPENTINE GORGE	43
AMOONGUNA	41
SCIENCE RESERVE	41
RAINBOW VALLEY	39
HERMANNSBURG	36
TREPHINA GORGE	36
GLEN HELEN GORGE	34
SANTA TERESA	33
ORMISTON GORGE AND POUND	33
N'DHALA GORGE	31
HENBURY METEORITES	29
REDBANK	29
ILLAMURTA SPRINGS	27
ALCOOTA EXC.	19
HAASTS BLUFF	18
ARLTUNGA	17
RUBY GAP	17
UKAKE	16
TI-TREE PASTORAL LEASE	13
ANGULA	12
IRRERLIRRE	11
CHAMBERS PILLAR	11
ANGARAPA	9
ANNAS RESERVOIR	9
YALPIRAKINU (MT.ALLAN)	6
YUENDUMU	4
MAC CLARK (ACACIA PEUCE)	0

Table 2 - Total conflict score for each case from highest to lowest

Quick statistical analysis can be taken one step further through the conflict matrix. A high total score does not necessarily reveal the overall distribution or characteristic of conflict throughout all conflicting encounters. For example, Figure 11 shows a comparison between Alice Springs Airport, a tourist area, and Amoonguna, an Aboriginal community. Though Alice Springs Airport has a slightly higher total score (43 versus 41) Amoonguna can be considered the slightly more at-risk area because it has high intensity conflict settings (= score of 3) with ten other parties while Alice Springs Airport has nine.

	A	B	C	D
1		ALICE SPRINGS AIRPORT	AMOONGUNA	ANGARAP
2	ALICE SPRINGS AIRPORT	0	3	
3	TI-TREE PASTORAL LEASE	0	0	
4	ALCOOTA EXC.	1	1	
5	AMOONGUNA	3	0	
6	ANGARAPA	0	0	
7	ANGULA	0	0	
8	HAASTS BLUFF	0	0	
9	HERMANNSBURG	1	0	
10	IRRERLIRRE	0	0	
11	IWUPATAKA	3	3	
12	SANTA TERESA	3	3	
13	UKAKE	0	0	
14	YALPIRAKINU (MT.ALLAN)	0	0	
15	YUENDUMU	0	0	
16	ALICE SPRINGS TELEG STN	3	3	
17	ANNAS RESERVOIR	0	0	
18	ARLTUNGA	2	2	
19	CHAMBERS PILLAR	1	1	
20	ELLERY CREEK BIG HOLE	2	2	
21	EMILY AND JESSIE GAPS	3	3	
22	FINKE GORGE	1	1	
23	GLEN HELEN GORGE	1	0	
24	HENBURY METEORITES	1	1	
25	ILLAMURTA SPRINGS	0	0	
26	KUYUNBA	3	3	
27	MAC CLARK (ACACIA PEUCE)	0	0	
28	N'DHALA GORGE	2	3	
29	ORMISTON GORGE AND POUNI	1	0	
30	RAINBOW VALLEY	2	2	
31	REDBANK	0	0	
32	RUBY GAP	0	0	
33	SCIENCE RESERVE	3	3	
34	SERPENTINE GORGE	1	1	
35	SIMPSONS GAP	3	3	
36	TREPHINA GORGE	3	3	
37	**Total**	43	41	

Figure 11 - Conflict matrix comparison between Alice Springs Airport and Amoonguna

Appendix II summarizes the cases according to each possible conflict score and gives the total mean at the bottom. From this simple analysis we see that the highest number of strong interest encounters (10) occurs in six cases including Amoonguna. Rainbow Valley has the highest rate of medium interest encounters (11) and Henbury Meteorites has the highest occurrence of low interest encounters (10). Overall, the thirty-five cases are more likely (mean = 5.14) to have a strong interest encounter than a low interest one (mean = 4.51), which is more likely to occur than a medium interest encounter (mean = 3.94)[vi]. Grossly stated, conflicting encounters in this region are more likely to be strong than weak.

Returning for a brief moment to the map analyses above, one unexpected finding was expressed. The possibility of competing interests between groups mapped within the same interest variable was not anticipated in the conception of this model, yet as Figures 9 and 10 show, this type of interaction is not uncommon, for the strong interest zone of all but two of the National Parks (18/20) touch the strong interest zone of at least one other National Park

(red touches red) and eight of the twelve Aboriginal communities have overlapping strong interest zones with at least one other community. The fact that this phenomenon was evident only in interactions among national parks and Aboriginal communities is more an artefact of case numbers than traits inherent only to those Interest groups. Since Pastoralism and Tourism were represented by only one case each, it would be impossible for interactions to exist between entities within their respective interest group.

Hypothetically, it has to be suspected that a difference exists even between the competing interests within interest groups. The Aboriginal interactions have a greater potential to be disputatious encounters while the National Parks encounters have a greater tendency towards collaboration. This is not to say that Aboriginal Australians are contentious by nature, nor are their interests within their communities more finite than those the National Parks have with themselves. Also, this is not to say that National Parks will not experience tensions that become disputes between them. The main factor influencing the hypothetical statement is that the variety of difference is greater among Aboriginal communities than among the National Parks. National Parks generally fall under the aegis of the State and Federal governments. Thus, they are theoretically more aligned in goal pursuits and there exists a higher authority to adjudicate disputes and police resolutions. Aboriginal communities are relatively autonomous authorities at the regional level and can differ greatly from one another. Therefore, competing interests may be seen as more of a win-lose situation.

5. Recommendations for further research

Analysis of this simple model has shown that a number of fruitful insights can be quickly gained from spatial representation of interests in a region. Furthermore, this type of exploratory approach allows for better work on the ground by, first, significantly narrowing areas of focus, second, providing direction as to some issues to explore and, third, giving an idea of some of the principal stakeholders involved in the conflicting encounters.

Despite its utility, a number of factors could be improved and expanded to hone the assessments. First, it would be worthwhile to create a way of working with an increased number of variables, for real-world conflict settings are much more complex than four interest groups each with a similar interest representation. One important variable could be size, for a larger area may act as a greater draw on other's interests than smaller areas[vii]. Additionally, larger areas may provide the resources to satisfy interests or extend a reach to greater distances. Finally, strength of interest may be influenced by the presence and condition of transportation and communication technologies.

Examples of other variables would be to include the number and magnitude of interests. As the original interest matrix (Appendix 1) suggests, not all interest groups have an equal number of interests to satisfy, nor are these interests equally important. Also, some interests may be positive in that they want access to or more of a particular resource, while others may be negative in that groups may want to avoid or deny entrance to other groups.

A second factor to improve the model in further studies would be to include mining as an interest that, though it has no physical presence in the study area, still plays an important role in the economic decision-making of the study area. And finally, a third improvement factor would be to increase the number of comparisons between interest groups. Instead of analysing only simple two-party conflict, it could be more heuristic to model interactions between several parties over the same area or competing interest[viii].

6. Conclusions

In short, the answer to the research question is "Yes. GIS can be a tool of assessing potential conflict between interests in a region." But this is not an unqualified, universal response, for several challenges or dangers of this research need be highlighted. First, it must be pointed out that increased complexity in the modelling can have critical drawbacks.

A corollary path of thought throughout this study has been the ease of comprehension this approach gives to dispute designers and lay stakeholders in the conflict. As Godschalk, et al. (1992) pointed out fifteen years ago,

> *Providing parties with a common database facilitates negotiation and reduces ungrounded, self-serving claims. At the same time, the complexity of the database tends to make parties somewhat uncertain as to how to understand the potential of their own bargaining space and, hence, somewhat tentative in discussing options with other parties before they generate consensus internally about their strategies. Balance is critical here. Too little information limits the negotiation possibilities; too much information can overwhelm participants.* (1211)

It quickly becomes possible to "overwhelm" the end user of such a model. Only through frequent contact with the end users on the part of the modeller can the 'reality' level of the model be determined the most efficacious.

A second point related to this is that assumptions around dependent and independent variables, the use of statistics, and even the type of visual representation via GIS do not seem to fit Aboriginal worldviews/knowledge and could be interpreted by participants in the evaluation as simply another white imposition.

Third, the conflict assessment modeller must also be aware that however useful and practical this approach may be in managing conflict, it could also present yet another obstacle to the development efforts of relatively remote, and therefore less conflicting, areas. To wit, this analysis could influence the efforts of regional policy planners to mitigate conflict in the at-risk areas by directing more development initiatives there, effectively reducing the flow of these finite resources to Yuendumu and Mac Clark and others like them.

Fourth, as briefly addressed in step 2 of the data preparation section there is a lack of relationship between National Park and Pastoral interests as shown by the original interest matrix (Appendix I). Although originally dismissed as an artefact of only cursory research, since it does not accurately represent actual interactions on the ground, this non-relationship is coincidentally supported by this GIS analysis in showing that the pastoral interest in this data set is too far from any national park for any area of overlapping interest to manifest itself. Someone relying too heavily upon the results of this model could easily make a potentially disastrous interpretation in assuming that no overlapping interest exists between national parks and pastoral leases in Central Australia. Complete reliance on statistical and graphical models, however powerful they may be, is ultimately a foolhardy approach to conflict assessment. To wit, these tools are meant to support decision-making in a human social environment and thus are only as strong as the person interpreting their results. Therefore, someone familiar with the region and its socio-cultural dynamics would be best placed to benefit from their utility.

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Appendix I - Original interest matrix

(derived from Harkin 2005; NTTC 2005; Schulz 1999; Corbett, et al. 1998)

This table presents the interest of each of the four Independent variables in relation to all the others as reported in one interview and a brief literature review. It does not attempt to be and should not be construed as fully representing the vast array of interests within and between these complex groups. This table simply sets the stage for the model presented in this document.

Column one signifies the perspective from which the interests will be determined. Row one lists the area in which column one may have an interest. For example, the Aboriginal groups have at least two definable interests in their own area (identity and empowerment). They have at least six in national park areas, five in pastoralist areas and one in tourism areas.

	Aboriginal	National Parks	Pastoralism	Tourism
Aboriginal	Identity	Co-Management	Purchasing/ Managing Stations	Income generation
	Empowerment	Access	Rehabilitating stations	
		Cultural Maintenance	Fresh beef for collective	
		Title	Cultural maintenance	
		Economic Concessions	Economic Subsistence	
		Employment		
National Parks	Co-Management	Visitor experience		Income Generation
	Data Collection	Interpretation		
	Labor Source			
Pastoralism			Economic benefits	
	Labor Source		Cultural Identity	Income diversification
Tourism	Centre for Indigenous Arts/Crafts	World Heritage listings	Improve visitor services	Flatten visitor rates across seasons
	Coordination	Coordination	Coordination	
		Partner with Uluru		

Table 3 - Original interest matrix

Appendix II - Summaries of interest interactions for each case

Case Name		# of No Interest Interactions	# of Low Interest Interactions	# of Medium Interest Interactions	# of High Interest Interactions
ALCOOTA EXC.		24	4	6	1
ALICE SPRINGS AIRPORT		14	8	4	9
ALICE SPRINGS TELEG STN		14	7	5	9
AMOONGUNA		17	5	3	10
ANGARAPA		31	0	3	1
ANGULA		29	3	0	3
ANNAS RESERVOIR		28	6	0	1
ARLTUNGA		25	3	7	0
CHAMBERS PILLAR		27	6	1	1
ELLERY CREEK BIG HOLE		16	2	9	8
EMILY AND JESSIE GAPS		14	8	3	10
FINKE GORGE		15	6	5	9
GLEN HELEN GORGE		18	7	3	7
HAASTS BLUFF		26	2	5	2
HENBURY METEORITES		17	10	5	3
HERMANNSBURG		17	7	4	7
ILLAMURTA SPRINGS		22	3	6	4
IRRERLIRRE		28	3	4	0
IWUPATAKA		14	4	7	10
KUYUNBA		12	9	5	9
MAC CLARK (ACACIA PEUCE)		35	0	0	0
N'DHALA GORGE		22	2	4	7
ORMISTON GORGE AND POUND		17	9	3	6
RAINBOW VALLEY		15	5	11	4
REDBANK		21	6	1	7
RUBY GAP		25	5	3	2
SANTA TERESA		21	1	7	6
SCIENCE RESERVE		17	5	3	10
SERPENTINE GORGE		15	5	7	8
SIMPSONS GAP		13	6	6	10
TI-TREE PASTORAL LEASE		29	1	3	2
TREPHINA GORGE		21	2	2	10
UKAKE		25	6	2	2
YALPIRAKINU (MT.ALLAN)		32	1	1	1
YUENDUMU		33	1	0	1
Total	N	35	35	35	35
	Mean	21.4	4.51	3.94	5.14

Appendix III - Series of conflict matrices showing the individual conflict score between each case and the total conflict score for each case

List of All Cases	Individual Case Comparisons			
	ALICE SPRINGS AIRPORT	TI-TREE PASTORAL LEASE	ALCOOTA EXC.	AMOONGUNA
ALICE SPRINGS AIRPORT	0	0	1	3
TI-TREE PASTORAL LEASE	0	0	2	0
ALCOOTA EXC.	1	2	0	1
AMOONGUNA	3	0	1	0
ANGARAPA	0	2	2	0
ANGULA	0	3	3	0
HAASTS BLUFF	0	0	0	0
HERMANNSBURG	1	0	0	0
IRRERLIRRE	0	0	2	0
IWUPATAKA	3	0	0	3
SANTA TERESA	3	0	0	3
UKAKE	0	0	0	0
YALPIRAKINU (MT.ALLAN)	0	2	0	0
YUENDUMU	0	1	0	0
ALICE SPRINGS TELEG STN	3	0	1	3
ANNAS RESERVOIR	0	3	0	0
ARLTUNGA	2	0	2	2
CHAMBERS PILLAR	1	0	0	1
ELLERY CREEK BIG HOLE	2	0	0	2
EMILY AND JESSIE GAPS	3	0	1	3
FINKE GORGE	1	0	0	1
GLEN HELEN GORGE	1	0	0	0
HENBURY METEORITES	1	0	0	1
ILLAMURTA SPRINGS	0	0	0	0
KUYUNBA	3	0	0	3
MAC CLARK (ACACIA PEUCE)	0	0	0	0
N'DHALA GORGE	2	0	0	3
ORMISTON GORGE AND POUND	1	0	0	0
RAINBOW VALLEY	2	0	0	2
REDBANK	0	0	0	0
RUBY GAP	0	0	2	0
SCIENCE RESERVE	3	0	0	3
SERPENTINE GORGE	1	0	0	1
SIMPSONS GAP	3	0	0	3
TREPHINA GORGE	3	0	2	3
Total	43	13	19	41

List of All Cases	Individual Case Comparisons			
	ANGARAPA	ANGULA	HAASTS BLUFF	HERMANNSBURG
ALICE SPRINGS AIRPORT	0	0	0	1
TI-TREE PASTORAL LEASE	2	3	0	0
ALCOOTA EXC.	2	3	0	0
AMOONGUNA	0	0	0	0
ANGARAPA	0	3	0	0
ANGULA	3	0	0	0
HAASTS BLUFF	0	0	0	2
HERMANNSBURG	0	0	2	0
IRRERLIRRE	2	1	0	0
IWUPATAKA	0	0	0	2
SANTA TERESA	0	0	0	0
UKAKE	0	0	1	2
YALPIRAKINU (MT.ALLAN)	0	0	0	0
YUENDUMU	0	0	0	0
ALICE SPRINGS TELEG STN	0	0	0	1
ANNAS RESERVOIR	0	1	0	0
ARLTUNGA	0	1	0	0
CHAMBERS PILLAR	0	0	0	0
ELLERY CREEK BIG HOLE	0	0	1	3
EMILY AND JESSIE GAPS	0	0	0	1
FINKE GORGE	0	0	2	3
GLEN HELEN GORGE	0	0	3	3
HENBURY METEORITES	0	0	0	2
ILLAMURTA SPRINGS	0	0	2	3
KUYUNBA	0	0	0	1
MAC CLARK (ACACIA PEUCE)	0	0	0	0
N'DHALA GORGE	0	0	0	0
ORMISTON GORGE AND POUND	0	0	2	3
RAINBOW VALLEY	0	0	0	1
REDBANK	0	0	3	3
RUBY GAP	0	0	0	0
SCIENCE RESERVE	0	0	0	1
SERPENTINE GORGE	0	0	2	3
SIMPSONS GAP	0	0	0	1
TREPHINA GORGE	0	0	0	0
Total	9	12	18	36

List of All Cases	Individual Case Comparisons			
	IRRERLIRRE	IWUPATAKA	SANTA TERESA	UKAKE
ALICE SPRINGS AIRPORT	0	3	3	0
TI-TREE PASTORAL LEASE	0	0	0	0
ALCOOTA EXC.	2	0	0	0
AMOONGUNA	0	3	3	0
ANGARAPA	2	0	0	0
ANGULA	1	0	0	0
HAASTS BLUFF	0	0	0	1
HERMANNSBURG	0	2	0	2
IRRERLIRRE	0	0	0	0
IWUPATAKA	0	0	2	0
SANTA TERESA	0	2	0	0
UKAKE	0	0	0	0
YALPIRAKINU (MT.ALLAN)	0	0	0	0
YUENDUMU	0	0	0	0
ALICE SPRINGS TELEG STN	0	3	2	0
ANNAS RESERVOIR	0	0	0	0
ARLTUNGA	2	1	2	0
CHAMBERS PILLAR	0	0	1	0
ELLERY CREEK BIG HOLE	0	3	0	1
EMILY AND JESSIE GAPS	0	3	3	0
FINKE GORGE	0	2	0	3
GLEN HELEN GORGE	0	2	0	1
HENBURY METEORITES	0	1	0	2
ILLAMURTA SPRINGS	0	1	0	3
KUYUNBA	0	3	2	0
MAC CLARK (ACACIA PEUCE)	0	0	0	0
N'DHALA GORGE	1	2	3	0
ORMISTON GORGE AND POUND	0	2	0	1
RAINBOW VALLEY	0	3	2	0
REDBANK	0	1	0	1
RUBY GAP	2	0	2	0
SCIENCE RESERVE	0	3	3	0
SERPENTINE GORGE	0	3	0	1
SIMPSONS GAP	0	3	2	0
TREPHINA GORGE	1	2	3	0
Total	11	48	33	16

List of All Cases	Individual Case Comparisons			
	YALPIRAKINU (MT.ALLAN)	YUENDUMU	ALICE SPRINGS TELEG STN	ANNAS RESERVOIR
ALICE SPRINGS AIRPORT	0	0	3	0
TI-TREE PASTORAL LEASE	2	1	0	3
ALCOOTA EXC.	0	0	1	0
AMOONGUNA	0	0	3	0
ANGARAPA	0	0	0	0
ANGULA	0	0	0	1
HAASTS BLUFF	0	0	0	0
HERMANNSBURG	0	0	1	0
IRRERLIRRE	0	0	0	0
IWUPATAKA	0	0	3	0
SANTA TERESA	0	0	2	0
UKAKE	0	0	0	0
YALPIRAKINU (MT.ALLAN)	0	3	0	1
YUENDUMU	3	0	0	0
ALICE SPRINGS TELEG STN	0	0	0	0
ANNAS RESERVOIR	1	0	0	0
ARLTUNGA	0	0	2	0
CHAMBERS PILLAR	0	0	0	0
ELLERY CREEK BIG HOLE	0	0	2	0
EMILY AND JESSIE GAPS	0	0	3	0
FINKE GORGE	0	0	1	0
GLEN HELEN GORGE	0	0	1	0
HENBURY METEORITES	0	0	1	0
ILLAMURTA SPRINGS	0	0	0	0
KUYUNBA	0	0	3	0
MAC CLARK (ACACIA PEUCE)	0	0	0	0
N'DHALA GORGE	0	0	3	0
ORMISTON GORGE AND POUND	0	0	1	1
RAINBOW VALLEY	0	0	2	0
REDBANK	0	0	0	1
RUBY GAP	0	0	1	0
SCIENCE RESERVE	0	0	3	0
SERPENTINE GORGE	0	0	2	1
SIMPSONS GAP	0	0	3	1
TREPHINA GORGE	0	0	3	0
Total	6	4	44	9

List of All Cases	Individual Case Comparisons			
	ARLTUNGA	CHAMBERS PILLAR	ELLERY CREEK BIG HOLE	EMILY AND JESSIE GAPS
ALICE SPRINGS AIRPORT	2	1	2	3
TI-TREE PASTORAL LEASE	0	0	0	0
ALCOOTA EXC.	2	0	0	1
AMOONGUNA	2	1	2	3
ANGARAPA	0	0	0	0
ANGULA	1	0	0	0
HAASTS BLUFF	0	0	1	0
HERMANNSBURG	0	0	3	1
IRRERLIRRE	2	0	0	0
IWUPATAKA	1	0	3	3
SANTA TERESA	2	1	0	3
UKAKE	0	0	1	0
YALPIRAKINU (MT.ALLAN)	0	0	0	0
YUENDUMU	0	0	0	0
ALICE SPRINGS TELEG STN	2	0	2	3
ANNAS RESERVOIR	0	0	0	0
ARLTUNGA	0	0	0	2
CHAMBERS PILLAR	0	0	0	1
ELLERY CREEK BIG HOLE	0	0	0	2
EMILY AND JESSIE GAPS	2	1	2	0
FINKE GORGE	0	1	3	1
GLEN HELEN GORGE	0	0	3	0
HENBURY METEORITES	0	2	2	1
ILLAMURTA SPRINGS	0	0	2	0
KUYUNBA	1	1	2	3
MAC CLARK (ACACIA PEUCE)	0	0	0	0
N'DHALA GORGE	0	0	0	3
ORMISTON GORGE AND POUND	0	0	3	1
RAINBOW VALLEY	0	3	2	2
REDBANK	0	0	3	0
RUBY GAP	0	0	0	1
SCIENCE RESERVE	0	0	2	3
SERPENTINE GORGE	0	0	3	1
SIMPSONS GAP	0	0	3	3
TREPHINA GORGE	0	0	0	3
Total	17	11	44	44

List of All Cases	Individual Case Comparisons			
	FINKE GORGE	GLEN HELEN GORGE	HENBURY METEORITES	ILLAMURTA SPRINGS
ALICE SPRINGS AIRPORT	1	1	1	0
TI-TREE PASTORAL LEASE	0	0	0	0
ALCOOTA EXC.	0	0	0	0
AMOONGUNA	1	0	1	0
ANGARAPA	0	0	0	0
ANGULA	0	0	0	0
HAASTS BLUFF	2	3	0	2
HERMANNSBURG	3	3	2	3
IRRERLIRRE	0	0	0	0
IWUPATAKA	2	2	1	1
SANTA TERESA	0	0	0	0
UKAKE	3	1	2	3
YALPIRAKINU (MT.ALLAN)	0	0	0	0
YUENDUMU	0	0	0	0
ALICE SPRINGS TELEG STN	1	1	1	0
ANNAS RESERVOIR	0	0	0	0
ARLTUNGA	0	0	0	0
CHAMBERS PILLAR	1	0	2	0
ELLERY CREEK BIG HOLE	3	3	2	2
EMILY AND JESSIE GAPS	1	0	1	0
FINKE GORGE	0	3	3	3
GLEN HELEN GORGE	3	0	1	2
HENBURY METEORITES	3	1	0	3
ILLAMURTA SPRINGS	3	2	3	0
KUYUNBA	2	1	1	1
MAC CLARK (ACACIA PEUCE)	0	0	0	0
N'DHALA GORGE	0	0	0	0
ORMISTON GORGE AND POUND	3	3	1	0
RAINBOW VALLEY	2	1	3	2
REDBANK	3	3	1	2
RUBY GAP	0	0	0	0
SCIENCE RESERVE	1	1	0	0
SERPENTINE GORGE	3	3	2	2
SIMPSONS GAP	2	2	1	1
TREPHINA GORGE	0	0	0	0
Total	43	34	29	27

List of All Cases	Individual Case Comparisons			
	KUYUNBA	MAC CLARK (ACACIA PEUCE)	N'DHALA GORGE	ORMISTON GORGE AND POUND
ALICE SPRINGS AIRPORT	3	0	2	1
TI-TREE PASTORAL LEASE	0	0	0	0
ALCOOTA EXC.	0	0	0	0
AMOONGUNA	3	0	3	0
ANGARAPA	0	0	0	0
ANGULA	0	0	0	0
HAASTS BLUFF	0	0	0	2
HERMANNSBURG	1	0	0	3
IRRERLIRRE	0	0	1	0
IWUPATAKA	3	0	2	2
SANTA TERESA	2	0	3	0
UKAKE	0	0	0	1
YALPIRAKINU (MT.ALLAN)	0	0	0	0
YUENDUMU	0	0	0	0
ALICE SPRINGS TELEG STN	3	0	3	1
ANNAS RESERVOIR	0	0	0	1
ARLTUNGA	1	0	0	0
CHAMBERS PILLAR	1	0	0	0
ELLERY CREEK BIG HOLE	2	0	0	3
EMILY AND JESSIE GAPS	3	0	3	1
FINKE GORGE	2	0	0	3
GLEN HELEN GORGE	1	0	0	3
HENBURY METEORITES	1	0	0	1
ILLAMURTA SPRINGS	1	0	0	0
KUYUNBA	0	0	2	1
MAC CLARK (ACACIA PEUCE)	0	0	0	0
N'DHALA GORGE	2	0	0	0
ORMISTON GORGE AND POUND	1	0	0	0
RAINBOW VALLEY	3	0	1	1
REDBANK	1	0	0	3
RUBY GAP	1	0	3	0
SCIENCE RESERVE	3	0	3	1
SERPENTINE GORGE	2	0	0	3
SIMPSONS GAP	3	0	2	2
TREPHINA GORGE	3	0	3	0
Total	46	0	31	33

List of All Cases	Individual Case Comparisons			
	RAINBOW VALLEY	REDBANK	RUBY GAP	SCIENCE RESERVE
ALICE SPRINGS AIRPORT	2	0	0	3
TI-TREE PASTORAL LEASE	0	0	0	0
ALCOOTA EXC.	0	0	2	0
AMOONGUNA	2	0	0	3
ANGARAPA	0	0	0	0
ANGULA	0	0	0	0
HAASTS BLUFF	0	3	0	0
HERMANNSBURG	1	3	0	1
IRRERLIRRE	0	0	2	0
IWUPATAKA	3	1	0	3
SANTA TERESA	2	0	2	3
UKAKE	0	1	0	0
YALPIRAKINU (MT.ALLAN)	0	0	0	0
YUENDUMU	0	0	0	0
ALICE SPRINGS TELEG STN	2	0	1	3
ANNAS RESERVOIR	0	1	0	0
ARLTUNGA	0	0	0	0
CHAMBERS PILLAR	3	0	0	0
ELLERY CREEK BIG HOLE	2	3	0	2
EMILY AND JESSIE GAPS	2	0	1	3
FINKE GORGE	2	3	0	1
GLEN HELEN GORGE	1	3	0	1
HENBURY METEORITES	3	1	0	0
ILLAMURTA SPRINGS	2	2	0	0
KUYUNBA	3	1	1	3
MAC CLARK (ACACIA PEUCE)	0	0	0	0
N'DHALA GORGE	1	0	3	3
ORMISTON GORGE AND POUND	1	3	0	1
RAINBOW VALLEY	0	0	0	2
REDBANK	0	0	0	0
RUBY GAP	0	0	0	1
SCIENCE RESERVE	2	0	1	0
SERPENTINE GORGE	2	3	0	2
SIMPSONS GAP	2	1	1	3
TREPHINA GORGE	1	0	3	3
Total	39	29	17	41

List of All Cases	Individual Case Comparisons		
	SERPENTINE GORGE	SIMPSONS GAP	TREPHINA GORGE
ALICE SPRINGS AIRPORT	1	3	3
TI-TREE PASTORAL LEASE	0	0	0
ALCOOTA EXC.	0	0	2
AMOONGUNA	1	3	3
ANGARAPA	0	0	0
ANGULA	0	0	0
HAASTS BLUFF	2	0	0
HERMANNSBURG	3	1	0
IRRERLIRRE	0	0	1
IWUPATAKA	3	3	2
SANTA TERESA	0	2	3
UKAKE	1	0	0
YALPIRAKINU (MT.ALLAN)	0	0	0
YUENDUMU	0	0	0
ALICE SPRINGS TELEG STN	2	3	3
ANNAS RESERVOIR	1	1	0
ARLTUNGA	0	0	0
CHAMBERS PILLAR	0	0	0
ELLERY CREEK BIG HOLE	3	3	0
EMILY AND JESSIE GAPS	1	3	3
FINKE GORGE	3	2	0
GLEN HELEN GORGE	3	2	0
HENBURY METEORITES	2	1	0
ILLAMURTA SPRINGS	2	1	0
KUYUNBA	2	3	3
MAC CLARK (ACACIA PEUCE)	0	0	0
N'DHALA GORGE	0	2	3
ORMISTON GORGE AND POUND	3	2	0
RAINBOW VALLEY	2	2	1
REDBANK	3	1	0
RUBY GAP	0	1	3
SCIENCE RESERVE	2	3	3
SERPENTINE GORGE	0	3	0
SIMPSONS GAP	3	0	3
TREPHINA GORGE	0	3	0
Total Conflict Score	43	48	36

[i] For a list of cases, see Table 2: Total Conflict Score.

[ii] Interests correlate with distance is a commonsense assumption but likely oversimplified in Central Australia given transportation and communication constraints. See further discussion in "Recommendations for future research".

[iii] See Table 1 for complete names for acronyms.

[iv] Calculated from the centroid.

[v] Yendumu, Yalpirakinu, Angula, Alcoota and Angarapa.

[vi] Statistical significance calculations would be meaningless at this stage for two reasons. First, knowing the statistical degree to which the different scores relate to one another it would add nothing to the analysis or decision-making. Second, even if weak interest encounters outnumbered strong interest encounters by 2:1, statistical significance pales in terms of meaning in the face of strong conflict potential - however prevalent other settings might be.

[vii] See discussion of Finke Gorge and Illamurta Springs as a simplistic illustration of this principle.

[viii] This can be somewhat done through the conflict matrix (Appendix III).
