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Biological evaluation of western spruce budworm defoliation on the Yakama Indian Reservation

TO: Glen Lisle, Forest Manager, Yakama Agency, Branch of Forestry September 9, 1998

Introduction

The current outbreak of the western spruce budworm on the Yakama Indian Reservation began in 1985. The purposes of this evaluation are to address causal factors underlying continuing defoliation in the mixed conifer zone of the Yakama I. R. and to discuss budworm response to treatments.

Forest health of the mixed conifer zone

The practices of removing large ponderosa pines and suppressing fires occurred in mixed conifer sites throughout much of the West. On the Yakama I. R., some of the original ponderosa pine stumps can still be located. Fire histories have been determined for many mixed conifer sites in the West, and it is clear that regular light surface fires favored the dominance of ponderosa pine on many of these sites. Cutting large ponderosa pines while supressing fires created successionally advanced forests dominated by Douglas-fir and grand fir. As a result, the mixed conifer zone has greater continuity of dead and downed fuel than in the historic condition. Fires that occur now on sites dominated by dense Douglas-fir and grand fir are more likely to be stand-replacing instead of the low intensity fires of the past.

The changing forest composition benefits some insects and pathogens. An increase in continuity of host foliage for the western spruce budworm, both vertically and horizontally,

increases larval success, facilitates the spread of Douglas-fir and true fir dwarf mistletoes, and increases the potential for spread of some root diseases, particularly Armillaria root disease, caused by *Armillaria ostoyae*, and laminated root rot, caused by *Phellinus weirii*. Repeated defoliation weakens trees, predisposing them to attack by bark beetles.

Western spruce budworm

Due to the increase in suitable habitat this century, outbreaks of the western spruce budworm last longer (Anderson et al. 1987), are more widespread and intense (Swetnam and Lynch 1993), and are generally more synchronous regionally (Swetnam and Lynch 1989). Repeated defoliation of Douglas-fir and grand fir by western spruce budworms results in radial and height growth loss, topkill or tree death. Thinning dense stands increases radial and height growth of residuals and increases larval dispersal loss (Carlson et al. 1985, Carlson and Wulf 1989). Thinning is especially effective when residuals are non-host species.

Direct suppression of budworms have been attempted in many areas of North America. Suppression projects in the northern Rocky Mountains did not control the western spruce budworm or change the course of regional outbreaks (Carlson et al. 1983, Fellin et al. 1984). In British Columbia, Shepard (1994) noted that high western spruce budworm mortality was difficult to obtain consistently by aerial spraying. Since 1980, over 2.1 million acres have been treated in Oregon and Washington to suppress western spruce budworm populations. Defoliation extent and severity were generally similar in treated and untreated areas (Powell 1994, Sheehan 1996). One of these projects covered 70,827 acres of the Yakama I. R. in 1990. A total of 23,609 gallons of *Bacillus thuringiensis* var kurstaki were sprayed. The project cost $1,087,544 (Hadfield 1990).

The eastern U.S. and Canada have a longer history of defoliator suppression projects than the West. These projects were attempts to reduce populations of the eastern spruce budworm. Macdonald and Webb (1963) reported that post-spray budworm survival was higher in sprayed areas than in unsprayed areas, and this higher survival rate produced an abundance of eggs, resulting in a return to pre-spray defoliation levels or in some cases an increase in defoliation. Holling (1981) stated that although fire suppression and eastern spruce budworm suppression may have been successful in the short term, the forest conditions that resulted were highly

vulnerable to both budworm defoliation and fire, and outbreaks of either budworm or fire were more costly and extensive than before suppression of both began.

Discussion

An aerial suppression project has been proposed by the Yakama BIA "to protect grand fir and Douglas-fir where western spruce budworm is active". A total of 55,000 acres would be sprayed in 1999, roughly comparable in size to the 1990 project. Areas proposed for treatment were not defined in the proposal, but "are scheduled to be commercially thinned within three years" (memorandum from Glen Lisle to Cory Winnie, August 25, 1998). Several points are worth considering:

◊ The 1990 Yakama budworm suppression project did not provide substantial relief from defoliation (see appendices, pages 7 through 19).

◊ Much of the area sprayed did not subsequently receive adequate silvicultural treatment to reduce the hazard.

◊ Direct suppression projects do not change forest composition.

◊ Spraying small units while omitting interspersed reserves (spotted owl habitat, late successional areas, etc.) compromises the treatments because the reserves serve as budworm refugia, and larvae quickly reinvade.

◊ Past spray projects used economic analyses based on many years of protection; these expectations are unreasonable and inappropriate.

◊ Landscape level spray projects have been consistently unsuccessful; silvicultural treatments have been shown to be effective in reducing defoliation levels.

Currently, many stands in the mixed conifer zone are dominated by Douglas-fir and grand fir, with few or no early seral species such as ponderosa pine, western larch, western white pine, and lodgepole pine. Thinning these stands may not have the desired result; residual trees may be

weakened beyond the point of recovery, and Douglas-fir beetles may kill the larger of these. To further complicate matters, some stands on the Yakama I. R. that have only Douglas-fir and grand fir present and that have been recently thinned are still experiencing moderate to heavy defoliation by the western spruce budworm. Given the amount of land included in reserves and a forest policy that significantly restricts regeneration harvests, the task of selecting and prioritizing treatments is quite difficult. Early seral species cannot regain their former, historic dominance in the mixed conifer zone without openings of adequate size. Selection cuttings in the mixed conifer zone only serve to perpetuate late seral species and maintain budworm habitat.

If the Yakama Tribal Council and Bureau of Indian Affairs Branch of Forestry wish to proceed with a budworm suppression project as proposed in the August 25 memorandum, the lowest priority stands considered for suppression should be non-host stands, dense host stands that will not be treated silviculturally within the next two years, host stands adjacent to reserves, stands with sufficient non-host species to be viable if host species are killed, and stands dominated by large Douglas-fir that are currently being mass-attacked by Douglas-fir beetles. Please contact me with any questions or for clarification. I did not discuss the biology of the western spruce budworm in this report because it is well documented in the literature and in previous reports.

Sincerely,

Paul

Paul Flanagan

cc: Dave Bridgwater
Jim Hadfield
Edwin Lewis
Carroll Palmer
Mark Petruncio
Bernie Ryan
John Vitello
Cory Winnie

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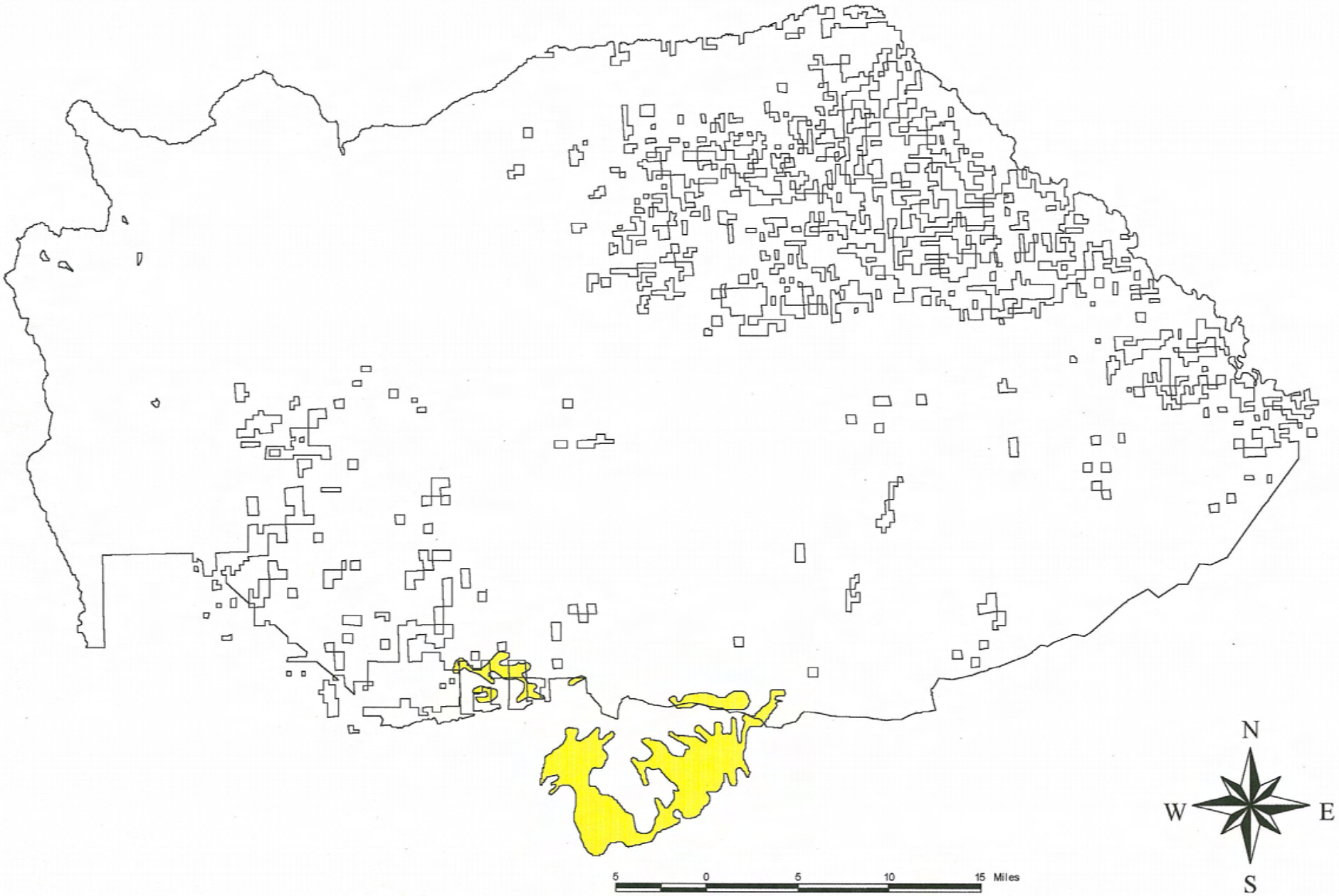
Western Spruce Budworm Defoliation
Yakima Indian Reservation, 1985



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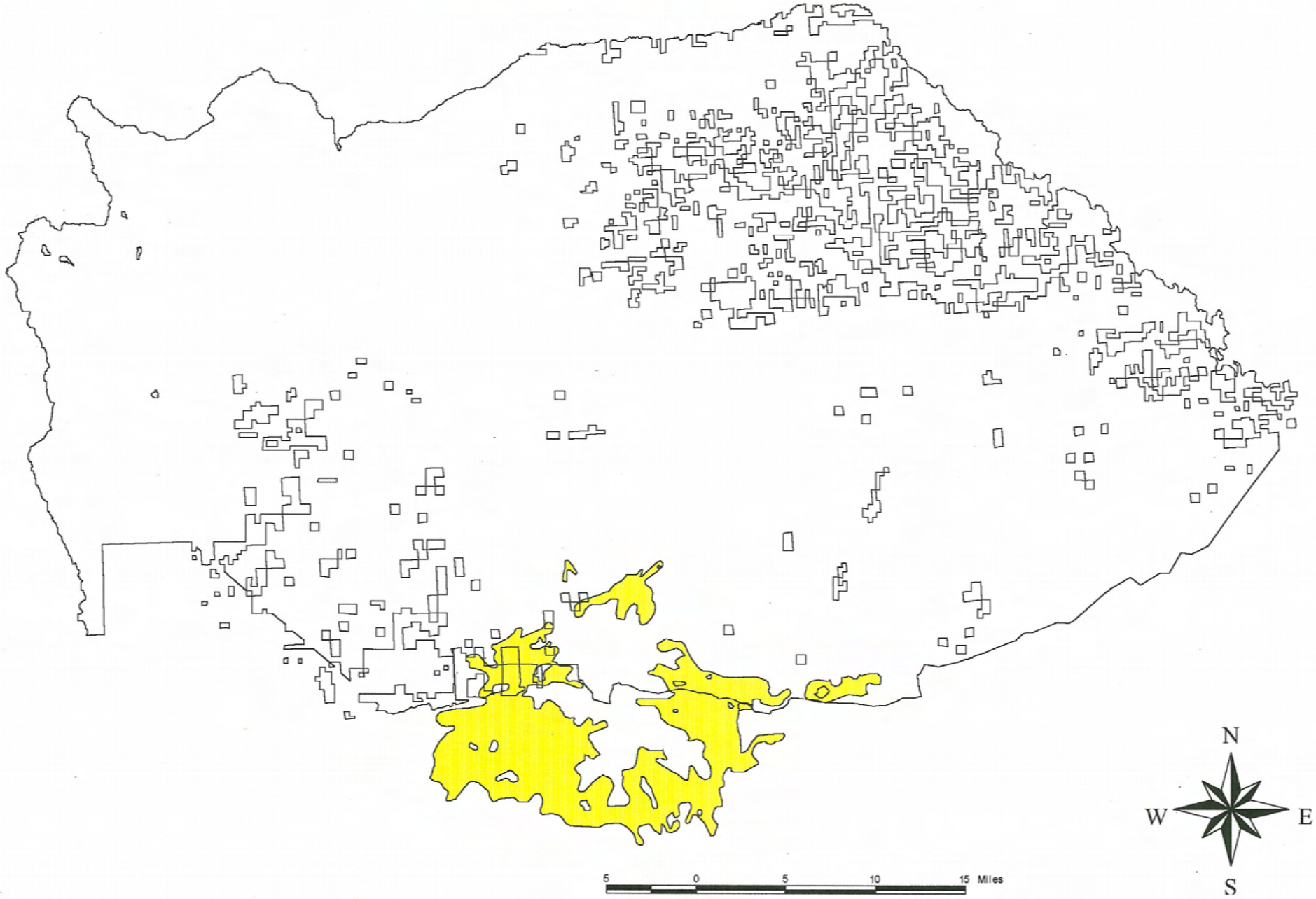

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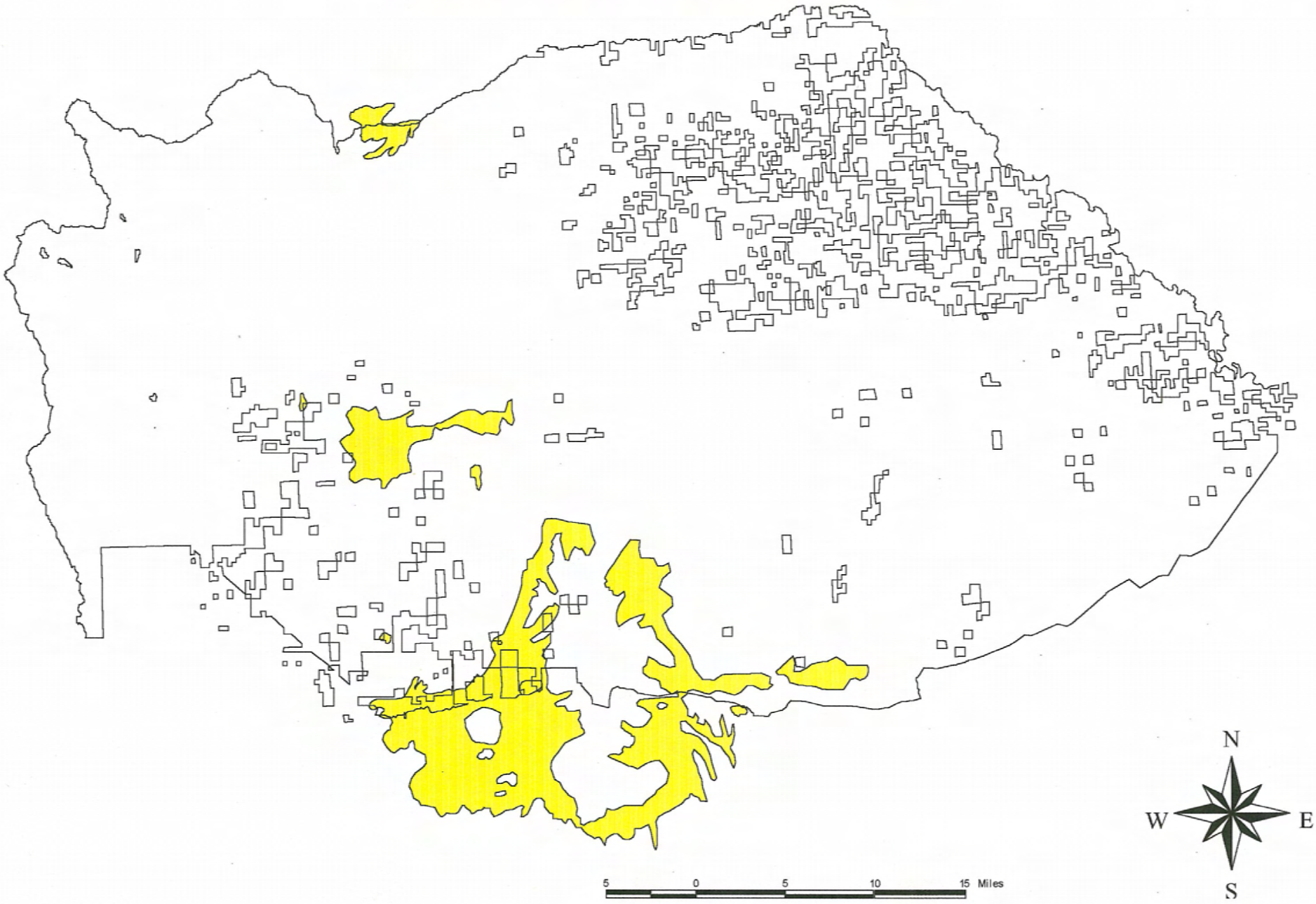

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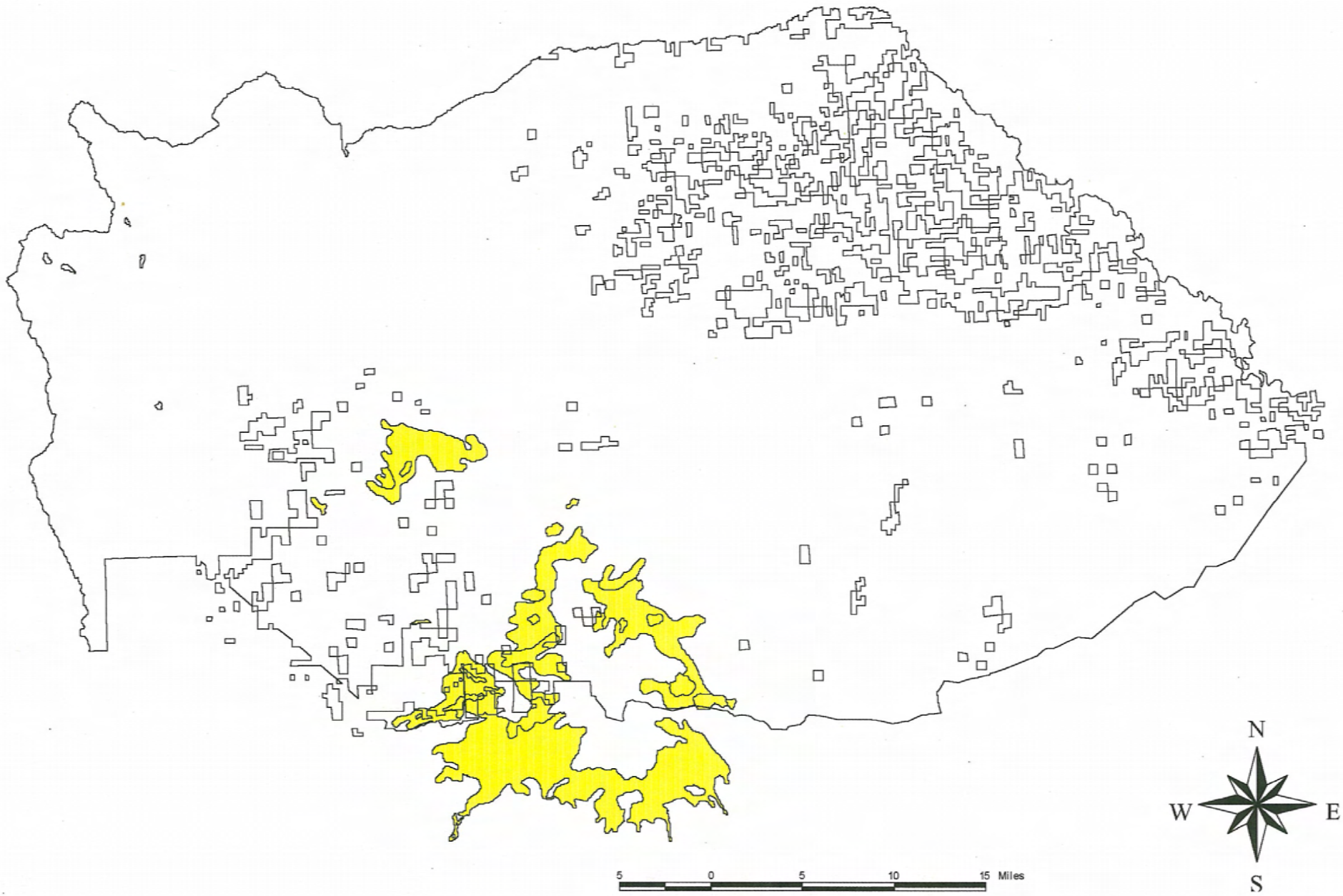

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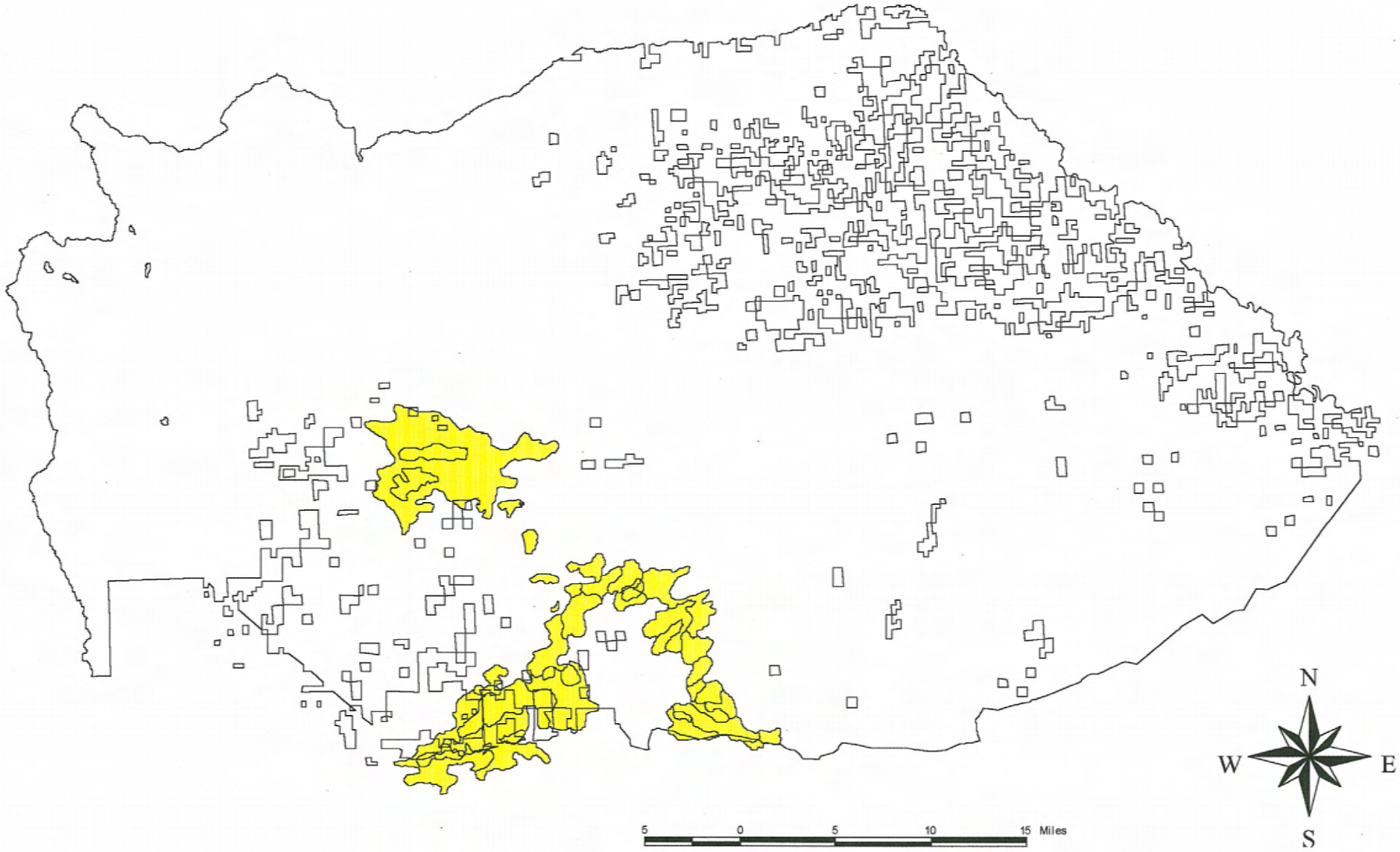

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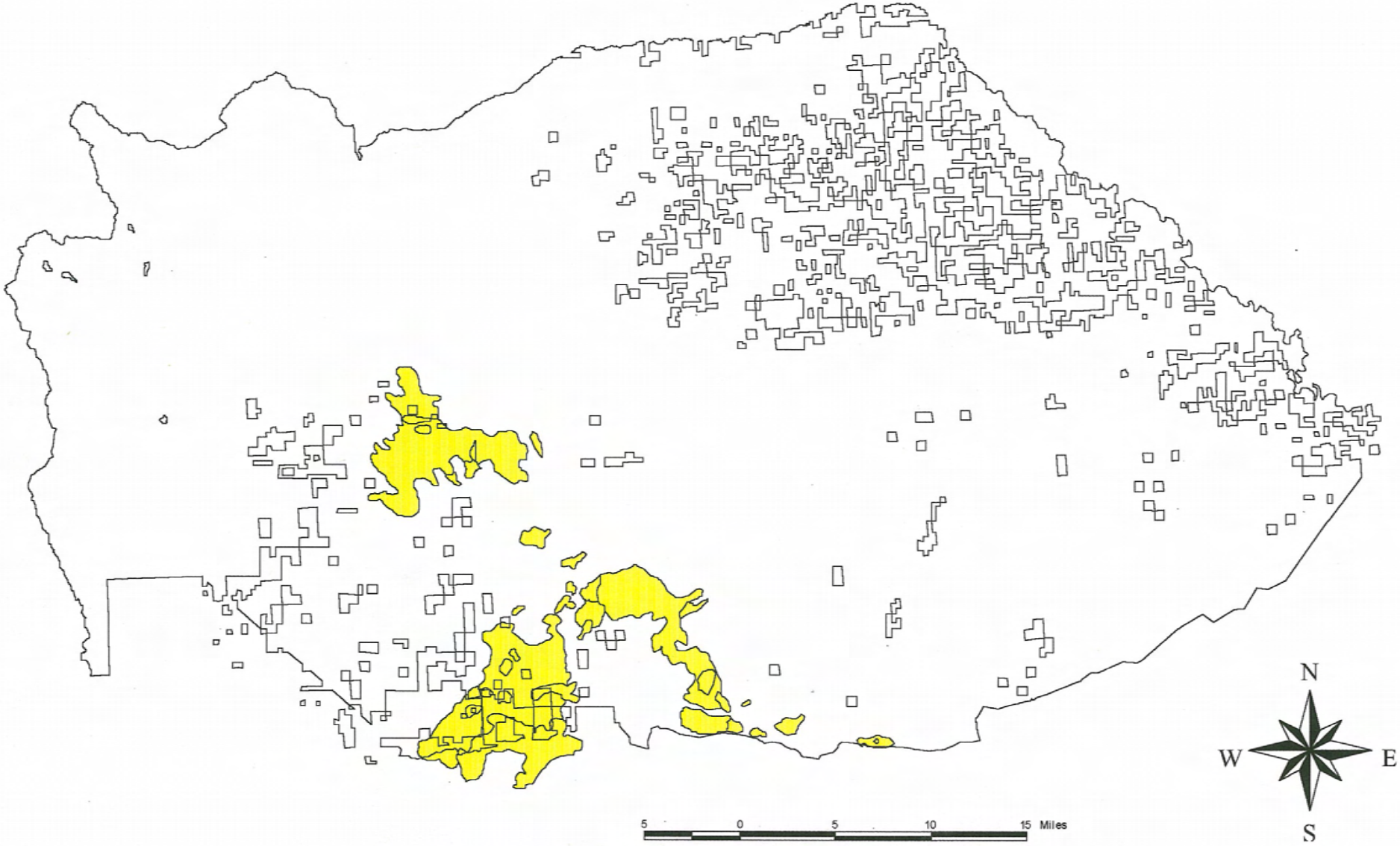

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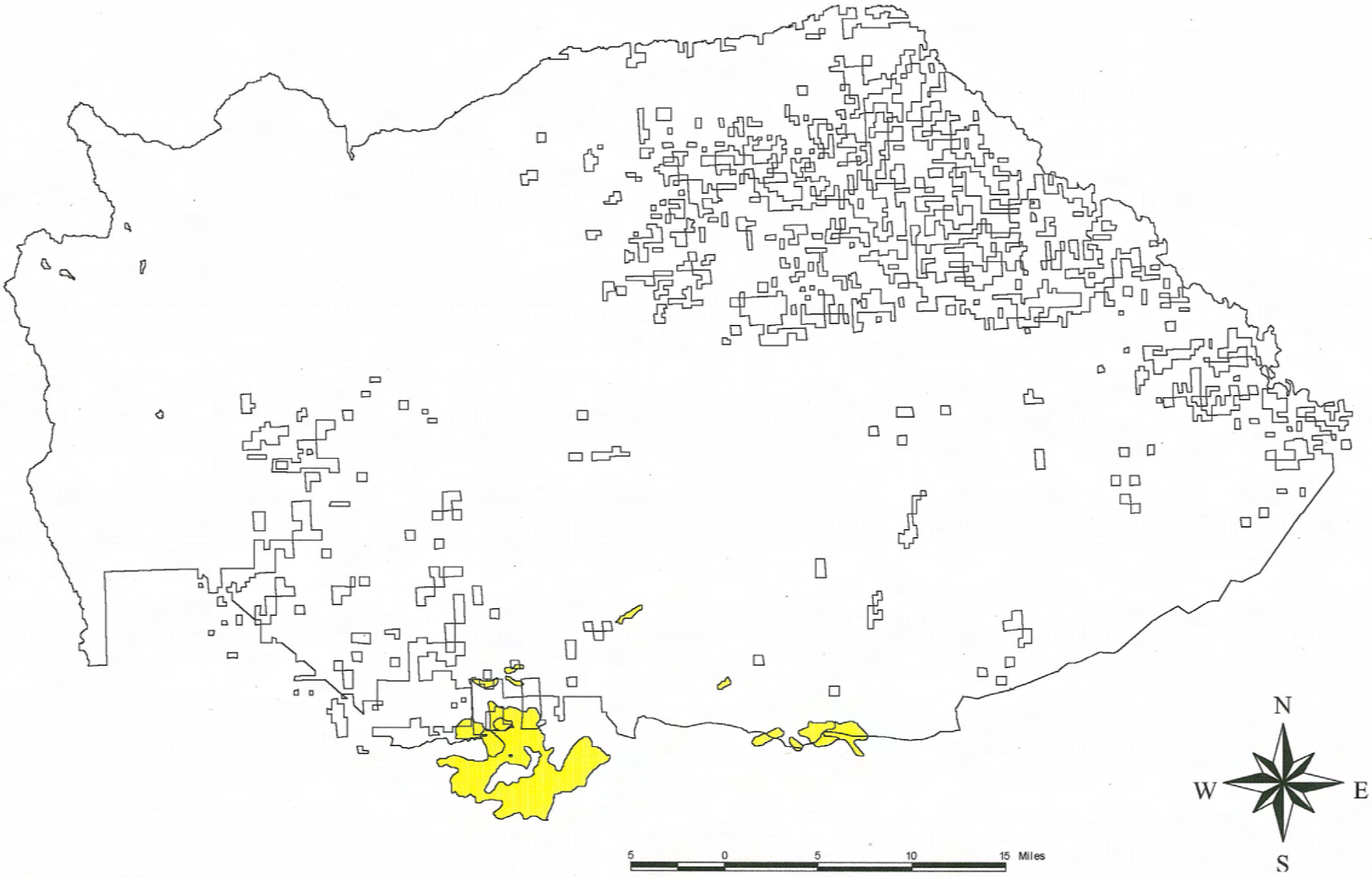

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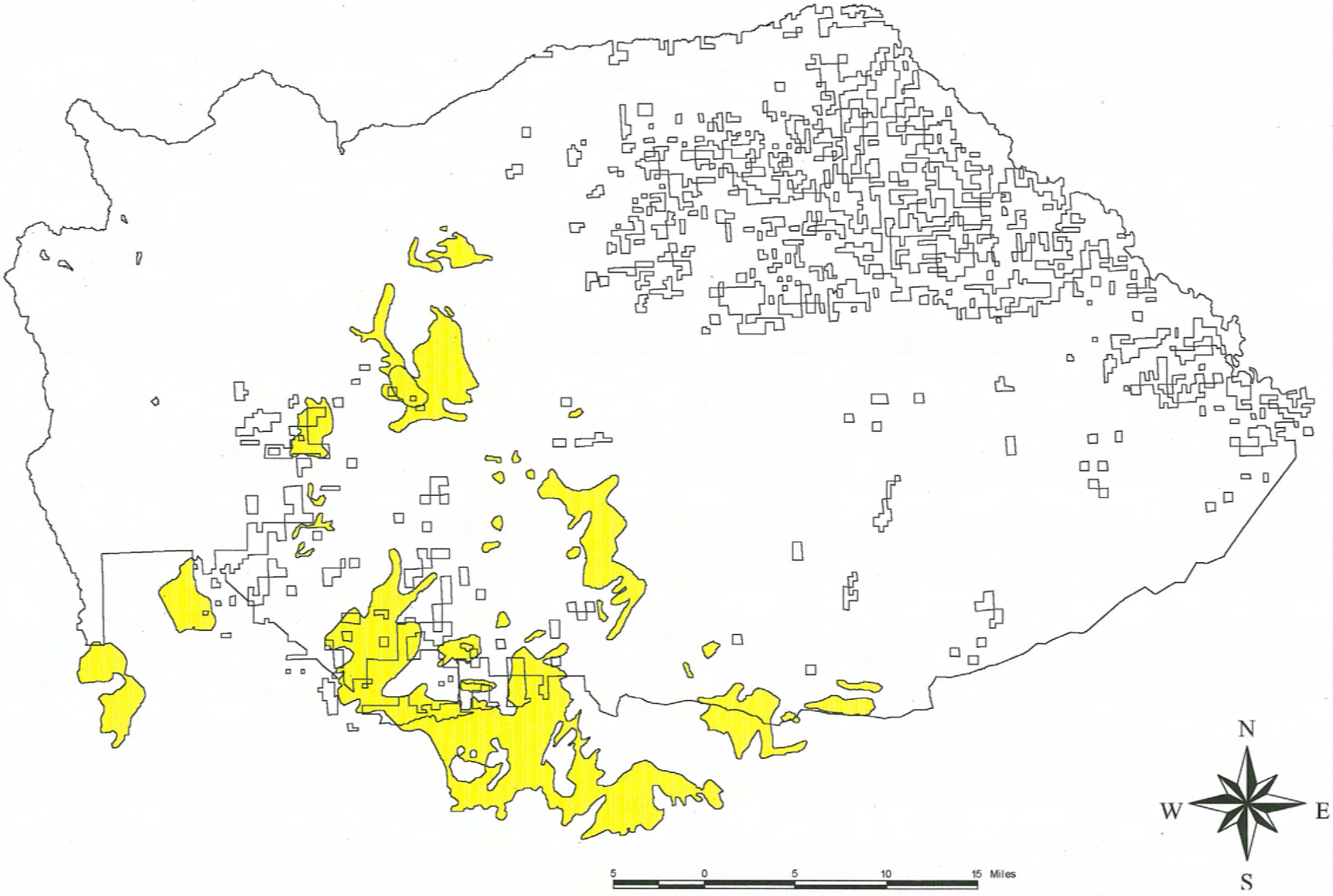

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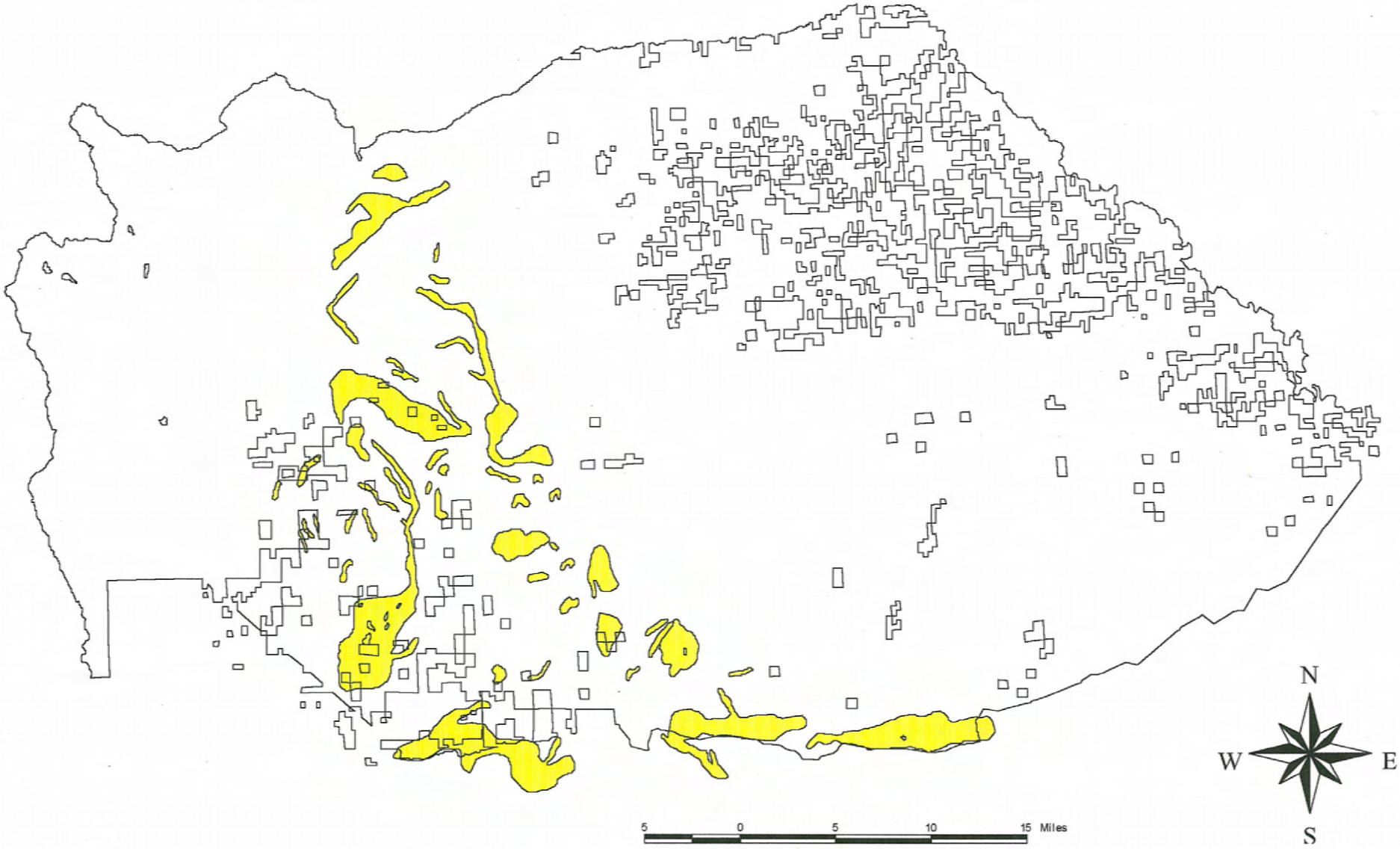

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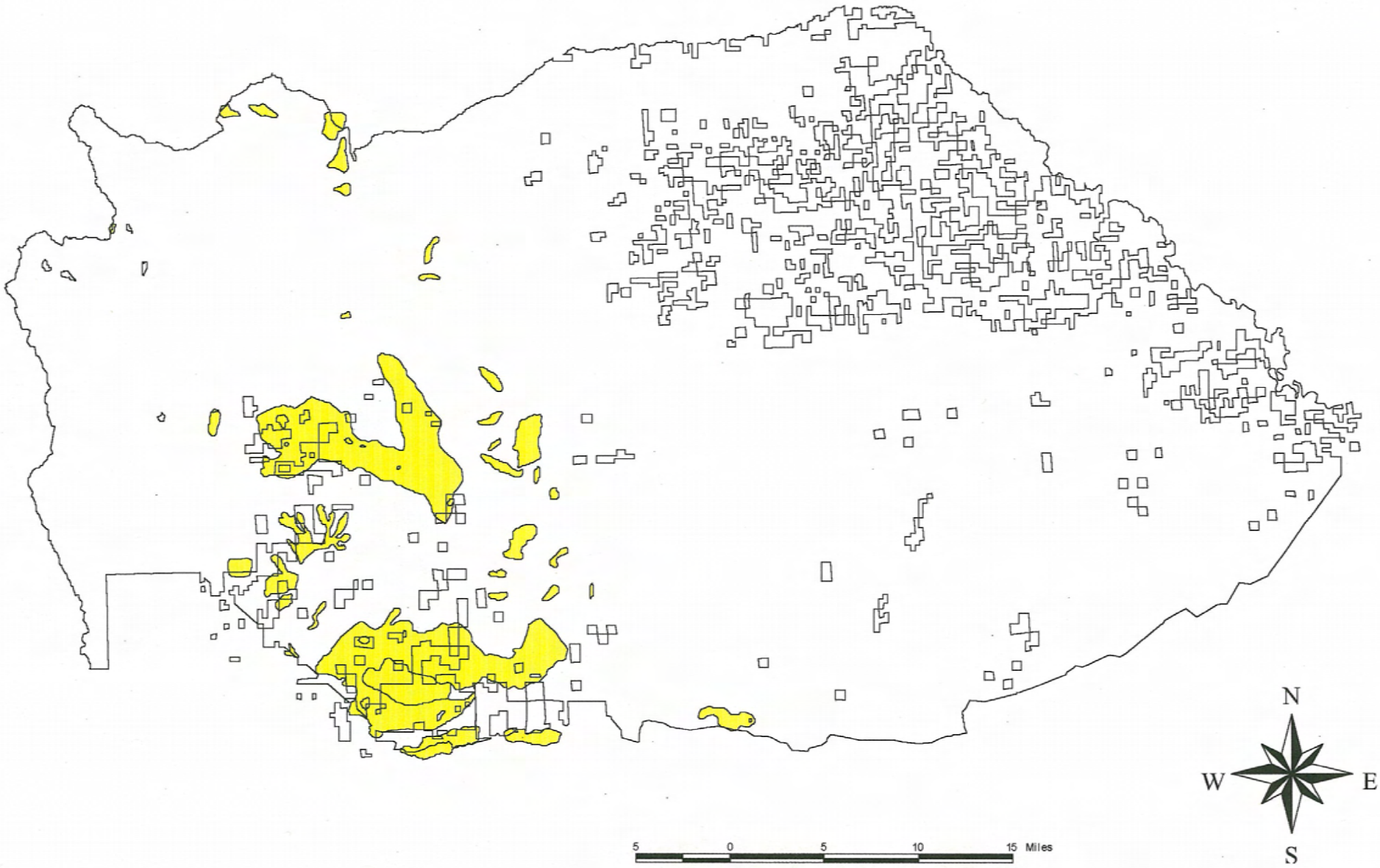

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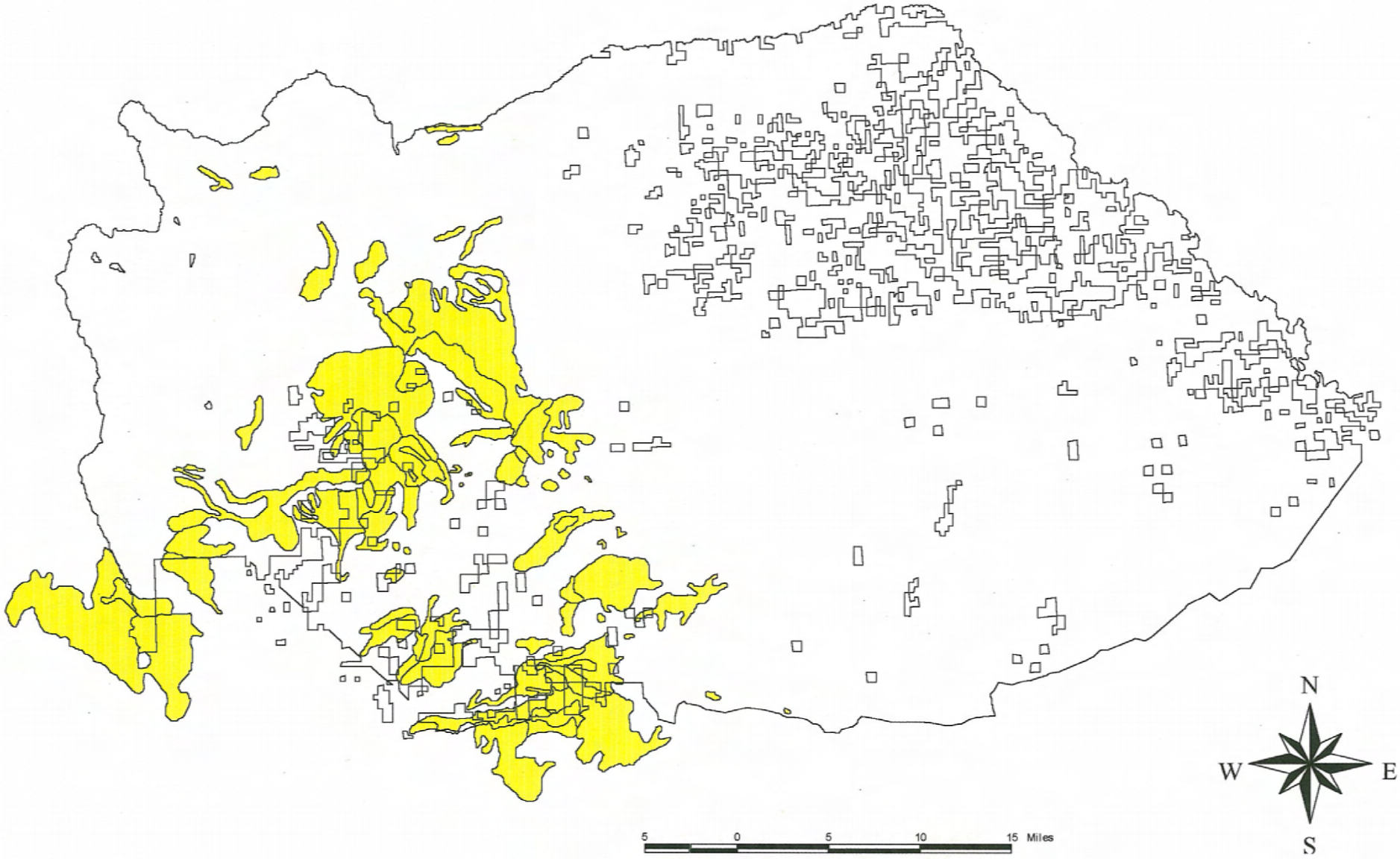

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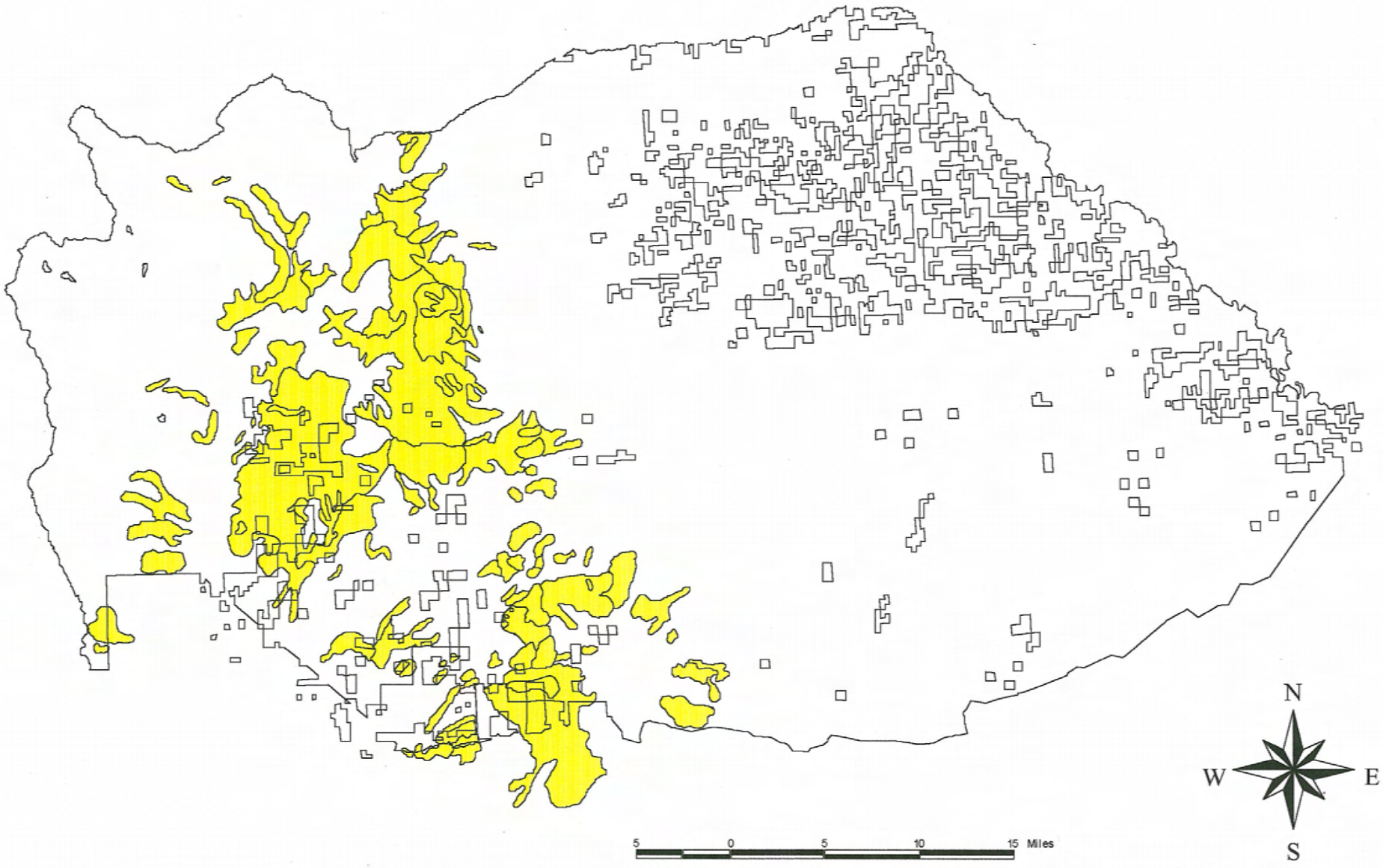

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