**Review of Eastern Collier Multiple Species Habitat Conservation Plan:**
**A Report to the Conservancy of Southwest Florida**

Reed F. Noss, Ph.D.
Conservation Science, Inc.
1255 E Peppertree Dr., Apt. 407
Sarasota, FL 34242

November 2018

## Introduction and summary

This report constitutes my review of the August 2018 draft of the Eastern Collier County Multiple Species Conservation Plan (hereafter, "the HCP" or "the Plan"). By way of introduction, I have been involved in conservation planning in Florida and elsewhere since the early 1980s. I designed the first statewide wildlife corridor network for Florida (Noss 1987, Noss and Cooperrider 1994), which was the forerunner of the Florida Ecological Greenways Network (Hoctor et al. 2000). I have been involved in developing and reviewing HCPs (and, in California, the companion state-level Natural Community Conservation Plans, NCCPs) since the early 1990s. From 1991 through 1994 I was a member of the Scientific Review Panel for California's NCCP program, appointed by Governor Pete Wilson. Our Scientific Review Panel developed the scientific guidelines for California's HCPs/NCCPs. I subsequently served as a scientific advisor and peer reviewer for multiple HCPs/NCCPs in California as well as the Pima County HCP (Sonoran Desert Conservation Plan) in Arizona. In these cases, I worked in an advisory capacity with the consultants who were developing the HCPs to assure scientific integrity and conservation adequacy of the plans. I was also an official peer reviewer of the draft plans (i.e., in California, HCPs/NCCPs are required to undergo independent scientific review).

One of my eight books specifically focused on HCPs: Noss et al. (1997), *The Science of Conservation Planning: Habitat Conservation under the Endangered Species Act*, Island Press. After returning to Florida I became a member of the Board of Trustees of the Florida Chapter of The Nature Conservancy (TNC), in which capacity I frequently worked with TNC staff to identify priority conservation lands in Florida. I had to resign from the TNC board when I was appointed by Governor Jeb Bush to the Acquisition and Restoration Council (ARC), the advisory body that recommends land acquisition priorities and reviews management plans for conservation areas in Florida, in which capacity I served in 2006 and 2007. I have conducted road ecology research in Florida and elsewhere for the last decade and a half. With Dan Smith and Marty Main, I coauthored the East Collier County Wildlife Movement Study (Smith et al. 2006), which is cited in the Plan. I was also a member (2008-2016) of the Technical Advisory Group for the statewide Critical Lands and Waters Identification Project (CLIP). Therefore, I am well qualified to review HCPs, especially with respect to their adequacy for protecting Florida's wildlife and ecosystems.

Given my experience in the field of conservation planning, I agree with the authors of the Plan that, from the standpoint of maintaining biodiversity and ecosystem function, coordinated

planning on a landscape to regional scale is superior to uncoordinated species-by-species, site-by-site, or project-by-project planning. HCPs make sense for other reasons. In particular, they address habitat, which is critical because the loss, fragmentation, and degradation of habitat remains the greatest proximate threat to biodiversity (Rands et al. 2010, Haddad et al. 2015). HCPs are intended to minimize and mitigate the effects of a permitted action, specifically incidental take, through the protection, restoration, and management of habitat for the species covered by the plan. Moreover, they address habitat conservation on private lands, which is important because more than half of species listed under the U.S. Endangered Species Act have 81% or more of their habitat on private or other non-Federal lands (U.S. General Accounting Office 1994). If done right, HCPs constitute the non-Federal land component of species recovery plans (Noss et al. 1997), with the additional benefit of proactively conserving species that are not (yet) federally listed. A scientifically defensible HCP that considers multiple species, natural communities, and ecological processes, is consistent with the first stated goal of the ESA: "to provide a means whereby the ecosystems upon which endangered species and threatened depend may be conserved" (ESA Section 2(b)).

Thus, the basic ecological theory and experience supporting regional, multi-species HCPs, as opposed to piecemeal planning, is sound. HCPs, however, vary widely in their scientific quality and conservation benefits. Scientific reviews suggest that many multi-species HCPs are of poor quality, often worse than single-species HCPs (Rahn et al. 2006). Encouragingly, I found the Eastern Collier HCP of higher quality than probably most HCPs. It is generally ecologically literate, fairly detailed in its discussion of covered species and potential impacts of the Plan on them, and well-written. Nevertheless, the Plan has several serious and arguably fatal flaws, which should be remedied before the Plan is formally approved. There are four particularly dangerous inadequacies of the Plan:

1. The Plan fails to account for increased traffic volume, which will inevitably occur as a result of the proposed development. Furthermore, the Plan does not adequately address the effects of this increased traffic on wildlife, through increased road mortality, barrier effects (fragmentation), and other impacts. Finally, the proposed mitigation measures (e.g., wildlife crossing structures and fencing) are likely inadequate, due to insufficient funding and inappropriate timing (i.e., such mitigation should be completed before construction begins).

2. The Marinelli Fund will almost certainly be inadequate to accomplish the plethora of conservation activities proposed to be covered by this Fund. In particular, it is expected to produce approximately $150 million over 50 years, but this is far too slow an accumulation, and probably too little in aggregate, to accomplish necessary mitigation such as wildlife crossings and land acquisition for key movement corridors. Funding must be front-loaded to mitigate development impacts.

3. The theoretical basis, operational structure, and description of adaptive management and monitoring in relation to the Plan are unacceptable. There is not nearly enough detail provided to determine the experimental design or monitoring program or to

discern precisely how results from monitoring will be used to learn more about the system and to change elements of the Plan in an adaptive fashion. The Plan lacks a true adaptive management framework.

4. The justification for selecting the Preferred Alternative (the Plan) over the PRT Configuration Alternative is not at all compelling. The PRT Configuration should be revisited as a superior alternative to the current Plan.

After an initial section on the biological significance of the Plan Area, I discuss each of these four major flaws below. I then follow with brief comments regarding the five specific topics that the Conservancy asked me to consider.

**Biological significance of Plan area**

The HCP does a marginally adequate job of documenting the ecological features and biological significance of the Plan area (e.g., Chapter 3, Environmental Setting; Chapter 4, Florida Panther; Chapter 5, Other Covered Species). However, I suggest it could be greatly improved by placing the Plan area explicitly within the context of statewide conservation priorities. The most recent statewide ecological prioritization for Florida is version 4 of the Critical Lands and Waters Identification Project (CLIP). Many of the data layers for CLIP were developed to inform the Florida Forever statewide land acquisition program. The CLIP clearly shows that the Plan Area is one of the most ecologically and biologically significant regions within the entire state of Florida (see http://www.fnai.org/pdf/CLIP_v4_technical_report.pdf). Therefore, as for any region with extremely high conservation value, it must be treated with extra caution and the most prudent application of the precautionary principle (Noss et al. 1997). An HCP that might be acceptable for a region of low biodiversity and conservation value would not be acceptable for this area.

I was a member of the Technical Advisory Group for CLIP, which included review of all versions, including version 4. At my request for this review, the Florida Natural Areas Inventory (FNAI) prepared maps from CLIP version 4 for Biodiversity, Landscapes, Surface Water, and Aggregated Priorities, with the Eastern Collier MSHCP boundaries overlaid. Brief descriptions of the core data layers for each category are in the legends for Figures 1-4 below. It is informative to compare these maps to the proposed HCP (Fig. 2-1 and 10-2 in the Plan) and to its most relevant alternative, the Panther Review Team (PRT) Configuration (Fig. 10-1 in the Plan). A visual comparison shows that several important (Priority levels 1 through 3) areas are missing from the Plan, especially south of Oil Well Road but also in the eastern and western portions of the Plan area, but are better captured by the PRT Alternative (see legends to individual figures).

Therefore, abundant statements in the Plan to the effect that the areas selected for Covered Activities have much lower conservation value than areas selected for Preservation (e.g., page i, "...the plan will provide permanent preservation and enhancement of approximately 107,000 acres of land that is substantially more valuable to listed species and other wildlife than the 45,000 acres that will be available for development...") are not entirely accurate.

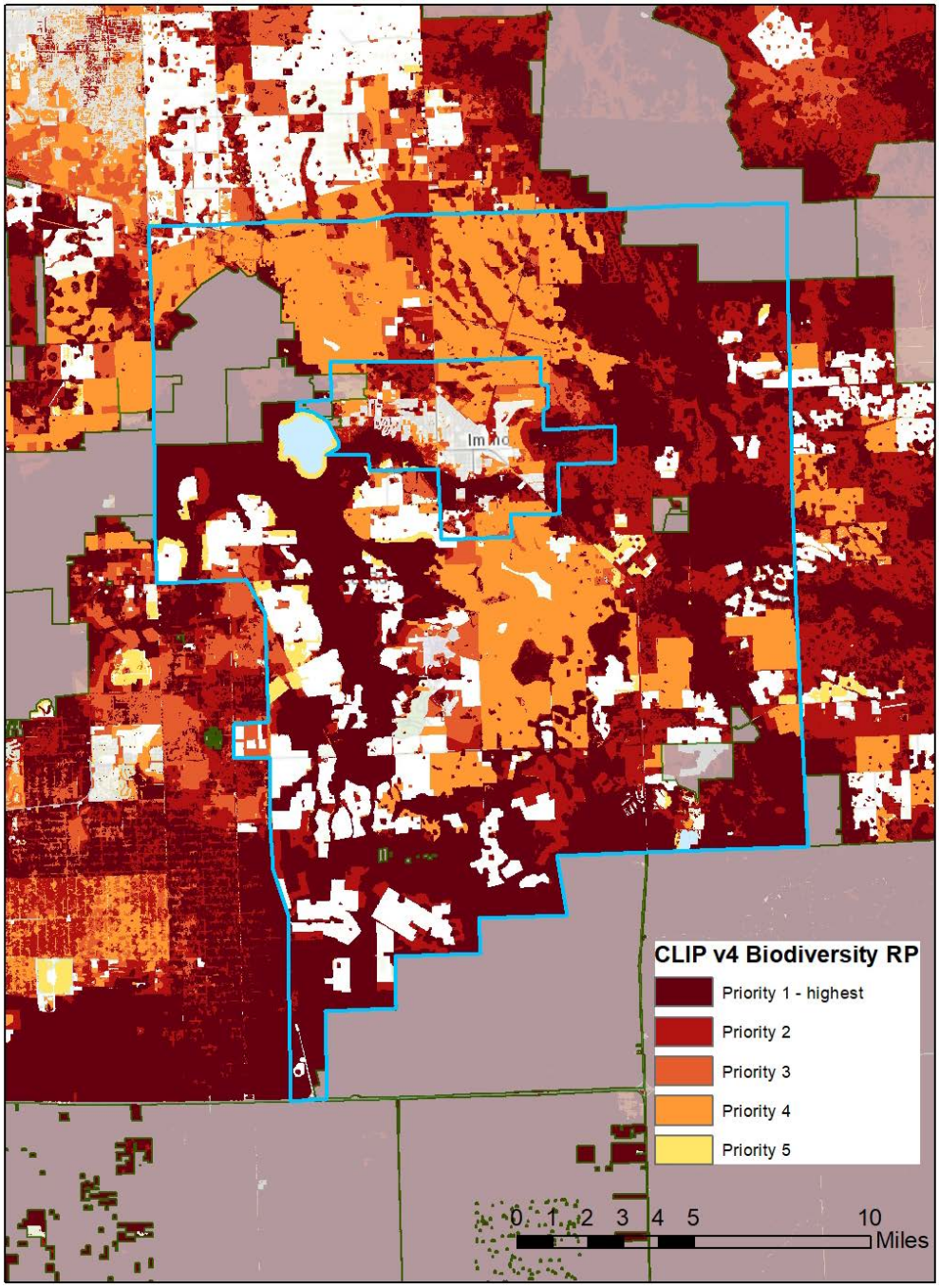


Figure 1. Biodiversity Resource Priorities from CLIP v.4 prioritization. Core data layers for development of this map are Strategic Habitat Conservation Areas (identifying gaps in the existing conservation area network for focal terrestrial vertebrates), Vertebrate Potential Habitat Richness (species richness hotspots), Rare Species Habitat Conservation Priorities (including plants and invertebrates as well as vertebrates, and Priority Natural Communities (14 natural community types that are under-represented on existing conservation lands). See http://www.fnai.org/pdf/CLIP_v4_technical_report.pdf for description of these data layers. In gray on map are existing conservation areas. Several areas of Covered Activities (development) in the Eastern Collier MSHCP, especially south of Oil Well Road and along the east side of SR 29, overlap with Priority 1-3 polygons. The PRT Configuration better captures these high-priority areas.

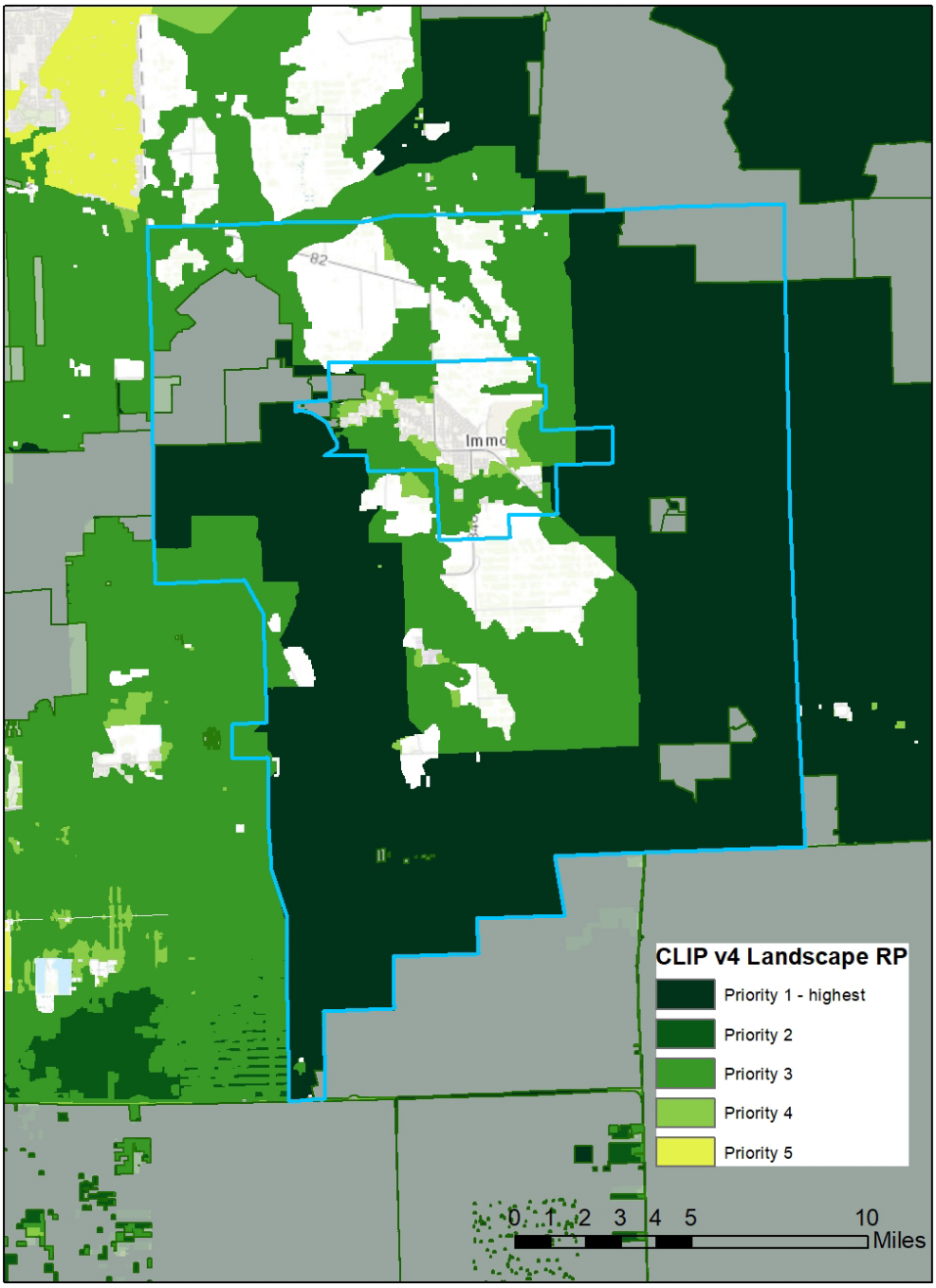


Figure 2. Landscape Resource Priorities from CLIP v.4 prioritization. Core data layers for development of this map are the Florida Ecological Greenways Network and a Landscape Integrity Index based on land-use intensity and patch size of natural communities and semi-natural land uses. See http://www.fnai.org/pdf/CLIP_v4_technical_report.pdf for description of these data layers. In gray on map are existing conservation areas. Several areas of Covered Activities (development) in the Eastern Collier MSHCP, especially south of Oil Well Road and in extensive portions of the eastern (e.g., east of SR 29) and western Plan area, overlap with Priority 1-3 polygons. The PRT Configuration better captures these high-priority areas.

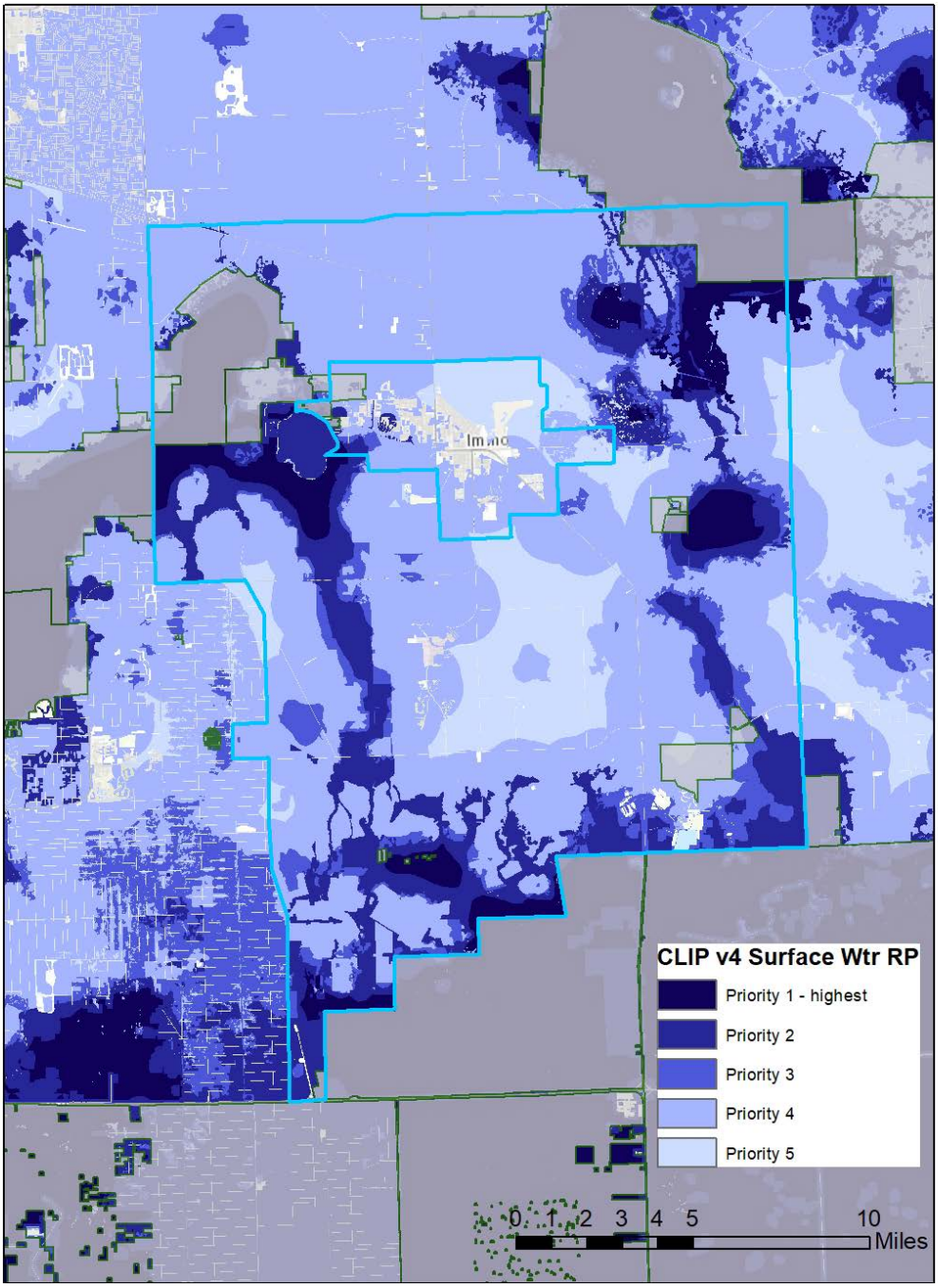


Figure 3. Surface Water Resource Priorities from CLIP v.4 prioritization. Core data layers for development of this map are Significant Surface Waters (derived from 7 water submodels), Natural Floodplain (FEMA 100-year floodplain), and Wetlands. See http://www.fnai.org/pdf/CLIP_v4_technical_report.pdf for description of these data layers. In gray on map are existing conservation areas. Both the Eastern Collier MSHCP and the PRT Configuration do a good job of capturing Priority 1-3 polygons.

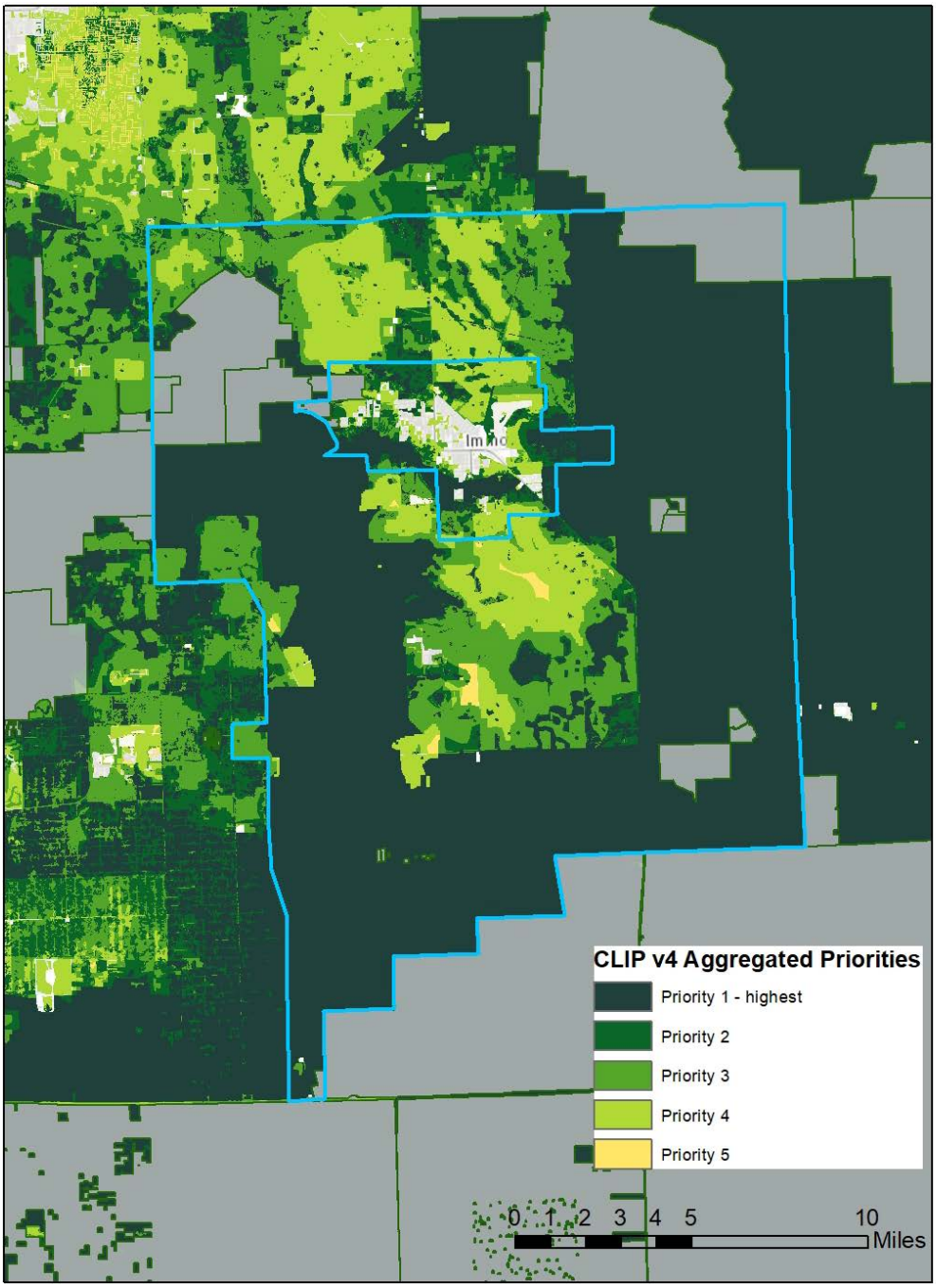


Figure 4. Aggregated Priorities from CLIP v.4 prioritization. This map represents an overlay of Biodiversity, Landscapes, and Surface Water Resource Priorities. See http://www.fnai.org/pdf/CLIP_v4_technical_report.pdf for description of these data layers. In gray on map are existing conservation areas. Several areas of Covered Activities (development) in the Eastern Collier MSHCP, especially south of Oil Well Road and in extensive portions of the eastern (e.g., east of SR 29) and western Plan area, overlap with Priority 1-3 polygons. The PRT Configuration better captures these high-priority areas.

The Florida Natural Areas Inventory also provided me with an up-to-date (10/29/18) list of species of conservation concern, which are tracked by their program (Table 1). As shown in Table 1, there are 20 species of conservation concern that have documented occurrences

within the boundaries of the Eastern Collier HCP area or nearby and therefore "likely occurring" based on proximity and suitable habitats. Table 1 lists these species along with their global conservation status (GRank, with G1-G3 considered of high concern), Florida statewide conservation status (SRank, paralleling GRank in status categories), federal listing status, and state listing status.

Table 1. Species Documented or Likely Occurring within boundaries of the Eastern Collier MSHCP. Data from Florida Natural Areas Inventory, 10/29/18. For the alligator, "SA" refers to similarity of appearance; it is protected (partially) due to similarity of appearance with the endangered American Crocodile. "C" denotes a candidate for federal listing. "FT" and "FE" under State Listing refer to federally threatened and federally endangered, which take priority over a potentially different state listing status.

| **Scientific Name** | **Common Name** | **GRank** | **SRank** | **Fed Listing** | **State Listing** |
|---|---|---|---|---|---|
| *Alligator mississippiensis* | American Alligator | G5 | S4 | SAT | FT(SA) |
| *Aphelocoma coerulescens* | Florida Scrub-jay | G2 | S2 | LT | FT |
| *Caracara cheriway* | Crested Caracara | G5 | S2 | T | FT |
| *Crotalus adamanteus* | Eastern Diamondback Rattlesnake | G4 | S3 | N | N |
| *Dendrophylax lindenii* | ghost orchid | G2G4 | S2 | N | E |
| *Drymarchon couperi* | Eastern Indigo Snake | G3 | S3 | LT | FT |
| *Egretta caerulea* | Little Blue Heron | G5 | S4 | N | ST |
| *Egretta thula* | Snowy Egret | G5 | S3 | N | N |
| *Egretta tricolor* | Tricolored Heron | G5 | S4 | N | ST |
| *Elanoides forficatus* | Swallow-tailed Kite | G5 | S2 | N | N |
| *Epidendrum nocturnum* | night-scented orchid | G4G5 | S2 | N | E |
| *Eudocimus albus* | White Ibis | G5 | S4 | N | N |
| *Gopherus polyphemus* | Gopher Tortoise | G3 | S3 | C | ST |
| *Haliaeetus leucocephalus* | Bald Eagle | G5 | S3 | N | N |
| *Mycteria americana* | Wood Stork | G4 | S2 | T | FT |
| *Plegadis falcinellus* | Glossy Ibis | G5 | S3 | N | N |
| *Puma concolor coryi* | Florida Panther | G5T1 | S1 | E | FE |
| *Rostrhamus sociabilis* | Snail Kite | G4G5 | S2 | E | FE |
| *Sciurus niger avicennia* | Big Cypress (Mangrove) Fox Squirrel | G5T2 | S2 | N | ST |
| *Ursus americanus floridanus* | Florida Black Bear | G5T4 | S4 | N | N |

It is worthwhile to compare the FNAI list of 20 species of conservation concern within the Plan area (Table 1, above) with the 19 species selected as Covered Species in the Plan (Tables 1-1, 1-2, 1-3, pp. 6-7 in Plan). Generally, the FNAI list (and natural heritage program/NatureServe lists in general) are considered more biologically defensible, as they are based on biological status and trend criteria alone and are not influenced by politics. On the other hand, local occurrences of species in the FNAI database are incomplete due to a number of reasons; for example, a

legitimate observation of a species at a particular site might not have been submitted to FNAI for inclusion in their database.

Although substantial overlap occurs between the two lists, there are notable differences. Eight species on the Covered Species list are absent from the FNAI list: Everglades mink, gopher frog, Florida sandhill crane, Florida burrowing owl, red-cockaded woodpecker, Florida bonneted bat, roseate spoonbill, and southeastern American kestrel. The Everglades mink, by that name, is absent from the FNAI tracking list, though they do track the same population (southern mink, southern Florida population), of questionable taxonomy (as indicated by the T2Q in the rank G5T2Q/S2) and with no occurrences confirmed within the Plan area. The recent sightings of mink within or near the Plan area, as reported in the Plan, have apparently not been submitted to FNAI. The gopher frog is tracked by FNAI as a G3/S3 species, but again no recent documented occurrences are in their database. The Plan includes it as a Covered Species "as a contingency due to its commensal relationship with the gopher tortoise" (p. 185), which is not unreasonable, although several authorities have warned against including species with no documented occurrences within the area covered by an HCP because data are insufficient to determine the effects of incidental take on the population (e.g., Harding et al. 2001).

Regarding the Florida sandhill crane, it is tracked by FNAI as a G5T2/S2 species, but with no occurrences in their database for the Plan area. This is acknowledged in the Plan, which states, however, that "extensive areas of potential suitable habitat" occur within the Plan area. A recent occurrence was documented in the Town of Rural West surveys (Amber Crooks, personal communication), but successful breeding status requires confirmation. Again, inclusion as a Covered Species may be imprudent due to insufficient data. For species such as the crane, it remains the responsibility of the landowners to assure impacts from development do not result in take; in the case of state-listed species such as the crane, state incidental take permitting may be the appropriate course of action.

The Florida burrowing owl is listed by FNAI as G4T3/S3, but again with no documented occurrences within the Plan area. Nevertheless, the Plan provides evidence of recent occurrences, apparently not submitted to FNAI. The red-cockaded woodpecker is listed by FNAI as G3/S2; although no occurrences are known within the Plan area, the Plan, perhaps legitimately, includes it "to account for any future stochastic dispersal events."

The Florida bonneted bat is a federal endangered species listed as G1/S1 by FNAI, the highest priority ranking, but with no occurrences within the Plan area in their database. However, the Plan correctly reports several recent observations. Continued surveys and documentation of successful breeding status are needed. In addition, consultation with the USFWS for this listed species will be needed outside of the HCP process. FNAI tracks roseate spoonbill (G5/S2), but typically maps only nesting colonies of individuals. The Plan does not document nesting colonies of spoonbills; this species may be "routinely observed within the HCP Area" (p. 198) but isolated foraging individuals or small groups are routinely observed virtually statewide. Thus, this may not be an appropriate Covered Species. The same can be said for the

southeastern American kestrel (G5T4/S3), which has no breeding records in Collier County (Plan, p. 194), so it is not clear why the kestrel was selected as a Covered Species.

The nine species recorded as having occurrences within or close to the Plan area by FNAI, but not included in the Plan as Covered Species, are ghost orchid, night-scented orchid, American alligator, snowy egret, white ibis, glossy ibis, swallow-tailed kite, bald eagle, and Florida black bear. The two orchids are both listed as endangered by the state of Florida, as well as S2 by FNAI. Although the law does not require state-listed plants, or even federally-listed plants, to be included as Covered Species in HCPs, most high-quality HCPs make every attempt to include plants for which enough is known about their biology, distribution, and status to determine potential effects of incidental take. Although it is claimed (Plan, p. 274) that state-listed species are included as Covered Species, this is not true for these orchids. I recommend that surveys for these species be conducted within the Plan area, and that they tentatively be included as Covered Species. It is not unlikely that they could occur within some of the small hammocks and forested wetlands that may be destroyed by development within the Plan area unless specifically protected. Listed plants receive only 5% of the funding given to animals under federal and state T&E programs, so they deserve much more conservation attention.

The American alligator was formally de-listed under the U.S. Endangered Species Act, a conservation success story, but still occurs on the list as a precautionary measure due to similarity of appearance with the federally threatened American crocodile. Since crocodiles do not occur naturally within the Plan area, I concur with the Plan's omission of the alligator from the Covered Species list. The three wading birds – snowy egret, white ibis, and glossy ibis – recorded by FNAI as occurring within or near the Plan boundaries but not included as Covered Species, require reconsideration. Apparently, these species are not included because they are not state-listed. However, two wading birds included as Covered Species, little blue heron and tricolored heron, are both ranked by FNAI as G5/S4, a more secure status than the snowy egret, ranked as G5/S3. For an HCP to fulfill its conservation function, biological status should take priority over legal status. The white ibis is ranked G5/S4 by FNAI, the same as the little blue and tricolored herons, so for consistency should be included as a Covered Species. The glossy ibis is G5/S3, a less secure ranking, so it deserves inclusion, as does the bald eagle, also ranked as G5/S3. The swallow-tailed kite, ranked G5/S2, is even more deserving of inclusion in the Covered Species list. Finally, the black bear also warrants consideration as a Covered Species. Although it was recently delisted by the state, and downranked to G5T4/S4 by FNAI, the delisting is controversial among biologists, and bears are very sensitive to habitat fragmentation, roadkill, and conflicts with humans, all of which are certain to occur if the Plan is implemented.

**Major Flaw #1: Failure of Plan to account for increased traffic volume, which will occur as a result of the proposed development; the effects of this increased traffic on wildlife, through increased road mortality, barrier effects (fragmentation), and other impacts; and the inadequacy of proposed mitigation measures**

I was shocked to see the relative inattention paid to road impacts in the Eastern Collier MSHCP. This deficiency, in my professional opinion, is the most glaring and dangerous flaw of the Plan. The 45,000 acres to be developed within the Plan area will accommodate 91,480 dwelling units and approximately 174,000 residents according to the Plan (Plan, p. iii). This assumes a gross density of 2.03 units per acre and 1.9 persons per household. However, utilizing the Census Bureau estimation of 2.58 persons per household and the densities of approximately 2.5 dwelling units per gross acre as stated in the Plan (Plan, p. 33), the number of units may be closer to 112,500, accommodating approximately 290,250 residents. Traffic volume models typically assume an average of two vehicles per household, so using the Plan's estimates of 91,480 dwelling units translates into 182,960 vehicles on the roads of eastern Collier County, potentially on a daily basis. If the total units are closer to 112,500, this would equate to 225,000 vehicles. Whether one uses the applicants' population/vehicles numbers or these adjusted numbers, this growth will have enormous impacts on wildlife and ecosystems within the Plan area, impacts that are virtually ignored and definitely are not mitigated by the Plan.

The Plan recklessly pushes off the responsibility for addressing road impact to FDOT and Collier County (MPO), but it is very dangerous to assume that these agencies will be given the budgets to construct the necessary wildlife crossing structures, fencing, signing, and other mitigation that will be required to prevent increased wildlife-vehicle collisions. Moreover, and I discuss this below in the next section, the Marinelli Fund is insufficient to fully mitigate road impacts, especially because it will accrue gradually over 50 years, whereas road mitigation must take place before any construction begins.

Astoundingly, the Plan states (p. 66), "...although the permits and the Plan do not anticipate that the Covered Activities will cause, and therefore do not cover, panther-vehicle collisions, the Plan will provide a source of funding for land preservation and activities that will help address the risk of such collisions, such as construction of additional wildlife crossings under and fencing along roadways." It is absurd not to anticipate that between 182,960 and 225,000 additional vehicles on the road will increase the rate of panther roadkills. Indeed, just prior to this statement, also on p. 66, the Plan acknowledges that "...panther mortalities resulting from panther-vehicle collisions have increased as a function of panther population increases, as well as increased vehicular traffic within the panther's range," with the first paper cited being Smith et al. (2006), the eastern Collier County wildlife movement study, on which I was second author and principal investigator. As stated above, the Marinelli Fund is not sufficient to address this problem. Mitigation of road impacts must occur prior to any construction, not just before (or after!) the sale of homes. Anyone who has driven on the rural roads of eastern Collier County is all too aware of the numerous dump trucks, speeding recklessly between quarries, landfills, and construction sites. This construction traffic will increase immensely, followed by the increase in personal vehicles as homes are sold at some undetermined rate over the next few decades.

The increased traffic volume, which would result from implementation of this HCP, poses a grave risk not only to the panther, but to most of the other Covered Species as well, such as the indigo snake (Breininger et al. 2012), diamondback rattlesnake, and gopher tortoise, which are often killed crossing or basking on roads, and the caracara, which forages on roadkill and often

becomes roadkill itself – as do bald eagles. The Plan (p. 126) acknowledges this, especially for juvenile caracara, citing Morrison (2003). Wood storks are vulnerable, as they often forage in ditches along roads, as are sandhill cranes, which are commonly struck as they saunter slowly across roads. Even the Florida scrub-jay is highly vulnerable to roadkill, to the extent that roadside territories are demographic sinks (Mumme et al. 2000), as acknowledged in the Plan. Collisions with vehicles are mentioned as threats to several of the Covered Species (e.g., sandhill crane, p. 188; burrowing owl, p. 191), but inexplicably the increased collisions that will inevitably result from much higher traffic volume under the Plan are not acknowledged as take. For Other Covered Species as a group, the Plan (p. 211) states that "the two forms of unintentional 'take' that could potentially result from the Covered Activities are 'harm' and 'harass'" and that, "for a number of species, take is unlikely," completely ignoring the direct take resulting from road mortality.

There are multiple instances of major omissions and misleading statements with regard to road impacts in the Plan. In section 4.2, on potential impacts to Florida panther, why is there no discussion of traffic volume increasing under the Plan and its causative relationship to road mortality? This is a direct impact to the panther (see pp. 75-80), likely even more serious than the impacts of construction disturbance or the indirect impacts such as "reduction in the utilization of habitats adjacent to those development areas by panthers and/or panther prey base" (Plan, p. 80), although these impacts will also be substantial. On page 33, footnote #12, the Plan states that "the ITPs will not authorize or control incidental take (or any other form of take) resulting from activities of third parties (e.g., actions that are not conducted by or on behalf of the applicants), such as collisions between vehicles and panthers or other Covered Species on roadways external to development projects." How can the Plan not take responsibility for the actions of those ostensible "third party" drivers of between 182,960 and 225,000 vehicles added to eastern Collier County's roads as a direct consequence of implementing the Plan? The same footnote goes on to trivialize the impacts of roads internal to development areas and state that it will not take responsibility for any of those impacts either. Such an irresponsible position on road impacts is clearly inconsistent with Section 10 of the Endangered Species Act, and indeed with the entire purpose of the Act.

The Panther Habitat Assessment Methodology (see Plan, section 4.2.2, p. 82) confounds panther habitat requirements with road mortality risk, such that additional acres of habitat are assumed to compensate for panther deaths on roads. There is no scientific basis or justification for this assumption. Setting aside additional land does not substitute for meaningful measures, such as high-quality wildlife crossing structures, to reduce roadkill. It is not clear that the Plan factored road mortality into its Panther Habitat Unit (PHU) analysis, but even if they had, this approach is not scientifically valid.

After a very confusing and unhelpful section on Panther Habitat Unit (PHU) analysis, the Plan concludes (p. 93) that "the Plan provides more than sufficient mitigation to offset potential panther habitat impacts." Whether or not this statement is accurate is of little consequence because the greater impacts of vastly increased traffic volume are not being mitigated or even acknowledged. Page 98 goes on to state that "the only form of potential take anticipated for

Florida panther and most other Covered Species within the 45,000 acres of Covered Activities – and the only form of take for which applicants seek take coverage for those species within that area – is harassment." This misleading statement again ignores the high level of take – in the form of road mortality and movement barrier impacts – that will occur outside the "Covered Activities" area on federal, state, and county roads as a result of increased traffic volume attributable to the Plan.

On page 99, the Plan quotes a 2017 USFWS Biological Opinion stating that "the Service will use [acres] of panther habitat as a surrogate for the numbers of individuals taken," which is clearly inappropriate when road mortality within the Plan area is likely the greatest risk for panthers. As noted above, acres of habitat do not substitute for specific mitigation to reduce the numbers of panthers killed on roads or stopped in their movements due to barrier effects of roads. To address road mortality, estimates of traffic volume increases on particular stretches of road are needed; such estimates are provided in the DEIS for the Plan (DEIS, Table 4.8-1, pp. 76-77). However, neither the Plan nor the DEIS take the necessary next steps of translating increased traffic volume into increases in the number of panthers killed annually on specific stretches of road, and then developing specific mitigation measures, in particular wildlife crossing structures and associated fencing.

Wildlife crossings are discussed in slightly more detail on pages 103-104 of the Plan. Amazingly the Plan states that "the HCP Area does not include the existing state and county roadway network." Of course, it does – or should – as those roads run across the entire Plan area. Here (p. 103) it is also stated that "avoidance and minimization of environmental impacts resulting from improvements to the transportation network are the responsibility of Florida Department of Transportation (FDOT) and Collier County Metropolitan Planning Organization (MPO), together with State and Federal environmental regulatory agencies." This is a blatant evasion of responsibility for impacts that are linked directly to implementation of the Plan, specifically adding between 182,960 and 225,000 vehicles to the roadways within eastern Collier County and beyond.

Proposed and ongoing FDOT road projects are listed on page 104, but these "improvements" will not be nearly enough to compensate for the increase in traffic volume attributable to the Plan. It is risky to assume that FDOT and MPO budgets will be increased sufficiently to address the impacts of development under the Plan. On page 110, the Plan again pushes off responsibility for mitigating traffic volume impacts to FDOT and MPO, explaining that "by providing the necessary land preservation (perpetual conservation easements) where wildlife crossings may be located, the Plan will facilitate minimization and mitigation of traffic impacts to panthers, even though the existing transportation network is not included as part of the Covered Activities." This evasion of responsibility places the panther at high risk.

Other Covered Species are at risk of increased roadkill under the Plan. Chapter 7 (beginning on p. 240), the "Conservation Plan for Other Covered Species," should include an extensive discussion of mitigation and avoidance measures for road mortality, including maps showing the locations of needed wildlife crossings for all species, fencing, elevated roadways, as well as

public transportation plans and other measures to reduce traffic volume. None of this is in the Plan. Road mortality avoidance and mitigation measures (Plan, p. 255) should be discussed in detail. Conserving Covered Species is not simply a matter of maintaining habitat quality in large, connected blocks if roads intersect those blocks and corridors.

At the top of page 257, there is a bullet on "designing internal roadway networks and roadway elements to minimize the potential for wildlife-vehicle collisions within the lands designated for Covered Activities," but increases in traffic volume will occur on all roads across the Plan area and beyond, including those roads that cross Preservation areas. Similarly, in Chapter 9, it is stated that the Marinelli Fund (see below) will assign "priority for conservation activities that address roadway impacts to species (such as fencing along roadways and construction of wildlife underpasses) will go to local and private roadways before federal and state roadways..." (Plan, pp. 286-287). This is not acceptable because increased traffic volume will impact wildlife throughout the Plan area, not just on local and private roads within the 45,000 acres most directly affected by development. The discussion of specific "initiatives to reduce roadway impacts" (Plan pp. 287-288) actually contradicts previous statements about prioritizing local and private roadways by listing mitigation actions on county and state routes.

I could continue with other examples from the Plan of how traffic volume impacts are ignored, trivialized, or passed on to other agencies to address, but I think this huge deficiency of the Plan is clear. Simply put, the Plan does not develop a mechanism to minimize and mitigate the tremendous risks to panthers and other Covered Species imposed by adding between 182,960 and 225,000 vehicles to this rural (for now) area of Collier County. Adequate mitigation requires specific studies of where road mortality is likely to occur, along with a detailed description of mitigation measures, including specific, mapped wildlife crossing structures and associated fencing.

**Major Flaw #2: Inadequate funding through the Marinelli Fund to accomplish the plethora of conservation activities proposed to be covered by this Fund**

The Marinelli Fund is another major weakness of the Plan, as mentioned above with respect to mitigation of increased road impacts. This Fund is expected to accumulate $150 million over 50 years, which would be $3 million annually if the money accrues at a constant rate. Compare that number to the $300 million per year available for conservation land acquisition statewide for more than two decades under Preservation-2000 and Florida Forever. Of course, the money will not accrue at a steady rate over time, but the Plan offers no information or analysis on how rapidly this money will accrue. The HCP should include a detailed economic analysis of the accumulation of money in the Marinelli Fund over time (say, at annual intervals over 50 years, based on modeled rates of construction and sales of dwellings) under alternative growth and sales scenarios. Timing is everything. In order to mitigate impacts of increased traffic volume, in particular (see above), it is critical that wildlife crossings, fencing, signs, and other structures be installed up-front, prior to any construction. The Marinelli Fund is expected to be used, in part, "to construct wildlife crossings" (e.g., Plan, p. 100), but it seems impossible that funds will accumulate rapidly enough to accomplish this task.

On pages 99-100, the discussion of what the Marinelli Fund is expected to accomplish is naïve. Wildlife crossing structures (bridges and box culverts) alone cost ca. $3.6 to 5 million each (2012 Panther Habitat Assessment Methodology, unpublished), and potentially dozens of new structures may be needed to mitigate the impacts of adding between 182,960 and 225,000 vehicles to the local and regional road network. Certainly, the statement (p. 100) that the Marinelli Fund will be "far in excess of what will be required to implement the Plan" is nonsense. On pages 106-107, Table 4-8, a number of Florida Panther Recovery Plan Actions are listed, which supposedly would be addressed by the Plan, but for many of these actions, "cost depends upon number of willing landowners and land prices" or "costs will be site specific." How will there be enough money to accomplish all of these actions? A thorough accounting is needed.

More detailed discussion of the Marinelli Fund in the Plan begins on page 283. I do not agree with the assertion that "the remainder of the costs associated with implementing the Plan...will be minimal compared to the value of the preserved lands" (Plan, p. 283). Costs of land acquisition (e.g., for corridors to assist panther movement northward), road impact mitigation, and a proper adaptive management and monitoring program (see below) will be enormous, yet there is no accounting of the potential costs of these activities in the Plan. Again, most of these costs will be up-front, before construction begins, and there is no assurance that the slow accumulation rate of the Marinelli Fund can meet this challenge. Indeed, the Plan states that "the applicants will contribute $350 per acre to the Fund as Covered Activities are initiated" (Plan, p. 284). This timing does not match the need for up-front funding. The second source of revenue, "a per-unit fee of $200 (adjusted periodically to account for adjustments in the Consumer Price Index) each time a home within the HCP Area is sold (including both initial sales and re-sales)" would come in far too late for meaningful mitigation.

I am confused by the statement (Plan, p. 286) that the Marinelli Fund "is also expected to be used for conservation initiatives that go beyond the Plan, such as construction of wildlife crossings and fencing, habitat acquisition and restoration, corridor enhancement, public education and outreach focused on the importance of wildlife conservation, and scientific research relevant to species conservation...at the discretion of the Marinelli Foundation Board of Directors." Why are these activities considered to go beyond the Plan? Most of these should be required activities to mitigate and compensate for the ecological damage caused by adding between 174,000 and 290,250 residents and between 182,960 and 225,000 vehicles to rural eastern Collier County. The rationale provided for the "beyond the Plan" language is that these activities "are not needed in order to fully offset the projected impacts of incidental take (because other elements of the Plan fully offset those impacts)" (Plan, p. 286). I strongly disagree with this assumption, and no detailed analysis is provided in the Plan to justify it.

**Major Flaw #3: Inadequate theoretical basis, operational structure, and description of adaptive management and monitoring in relation to the Plan**

A notable development in the evolution of HCPs was the "Five Point Policy" issued by the U.S. Fish and Wildlife Service in 1999 (U.S. Fish and Wildlife Service 2000). This policy stipulated that HCPs must include:

1) adaptive management provisions
2) measurable biological goals
3) monitoring to ensure compliance and measure the effectiveness of HCPs
4) public participation in the HCP process
5) establishment of appropriate permit duration

New rules accompanying this policy also provided that the U.S. Fish and Wildlife Service may revoke an incidental take permit if, as a result of unforeseen consequences, the plan places a listed species in jeopardy (Liebesman and Petersen 2003). The Five Point Policy may have led to an overall improvement in the quality of HCPs, although, to my knowledge, no rigorous assessment of the effects of the policy has been produced. A more recent rule, which took effect in 2005 (Federal Register Vol. 69, No. 237, December 10, 2004), revised the permit revocation policy, but the new policy is confusingly stated. The current revocation policy is summarized in a 2011 fact sheet: "The FWS will use its authority to manage any unforeseen circumstances that may arise to ensure that species are not jeopardized as a result of approved HCPs. In the rare event that jeopardy to the species cannot be avoided, the FWS may be required to revoke the permit" (U.S. Fish and Wildlife Service 2011).

Since the Five Point Rule was promulgated in 1999/2000, adaptive management and associated monitoring are required components of every HCP, although in practice these components are often poorly developed (Harding et al. 2001, Wilhere 2002). According to the review by Wilhere (2002), "few HCPs incorporate genuine adaptive management." A more recent review of regional HCPs similarly revealed "a considerable range of adaptive management approaches and a good number of plans without any adaptive management provisions at all" (Taylor and Doremus 2015). Moreover, abundant experience has shown that monitoring (an essential element of adaptive management) has a long history of poor implementation by agencies and is usually the first program to be cut when budgets are tight (Noss and Cooperrider 1994, Noss et al. 1997, Nichols and Williams 2006).

A simple definition of adaptive management was offered by Howes et al. (2010): "…an iterative process of gathering new knowledge regarding a system's behavior and monitoring the ecological consequences of management actions to improve management decisions." The rather long-winded description of adaptive management in the new HCP manual is consistent with this definition: "An adaptive approach involves exploring alternative ways to meet management objectives, predicting the outcomes of alternatives based on the current state of knowledge, implementing one or more of these alternatives, monitoring to learn about the impacts of management actions, and then using the results to update knowledge and adjust

management actions. Adaptive management focuses on learning and adapting, through partnerships of managers, scientists, and other stakeholders who learn together how to create and maintain sustainable resource systems" (USFWS and NMFS 2016: 10-28, 10-29).

Based on my review of many HCPs, the HCP handbook, and the technical literature of adaptive management since Noss et al. (1997), I suggest some basic requirements for implementation of adaptive management in HCPs:

- recognition that the system (e.g., natural community or species) being managed will never be understood completely, which is reflected in uncertainty about the ecological model chosen to represent the system
- acknowledgement of uncertainty about what policy or practice is "best" for the particular management problem, which is reflected in multiple competing hypotheses about the effects of management practices
- implementation of a plan of action designed to reveal critical knowledge about the system and its response to management that is currently lacking
- acknowledgment of the trade-off between gaining the most knowledge about the system vs. achieving the best short-term results, and attempting to balance these often competing objectives
- monitoring of carefully chosen response indicators to evaluate the outcome of alternative policies or management treatments
- analysis of management outcomes in consideration of the original objectives
- incorporation of the results of management experiments and other learning into decisions about new policies and management strategies and actions

The iterative and cyclic nature of adaptive management is captured in a graphical representation of the process (Fig. 5). The figure illustrates the progression from defining the problem to articulating management goals; developing an ecological model of the system (which can include socioeconomic variables); defining desired outcomes and performance metrics; selecting and evaluating conservation measures; conducting pilot and full-scale research on the problem (note: this is desirable but not always possible); designing and implementing conservation actions (these could also be policies or management/restoration actions); designing and implementing monitoring; collecting and managing data; analyzing and synthesizing the data, i.e., the results of management treatments; making recommendations; refining the knowledge base and the ecological models; refining management actions; revising objectives; and reassessing the problem…then begin the cycle anew.

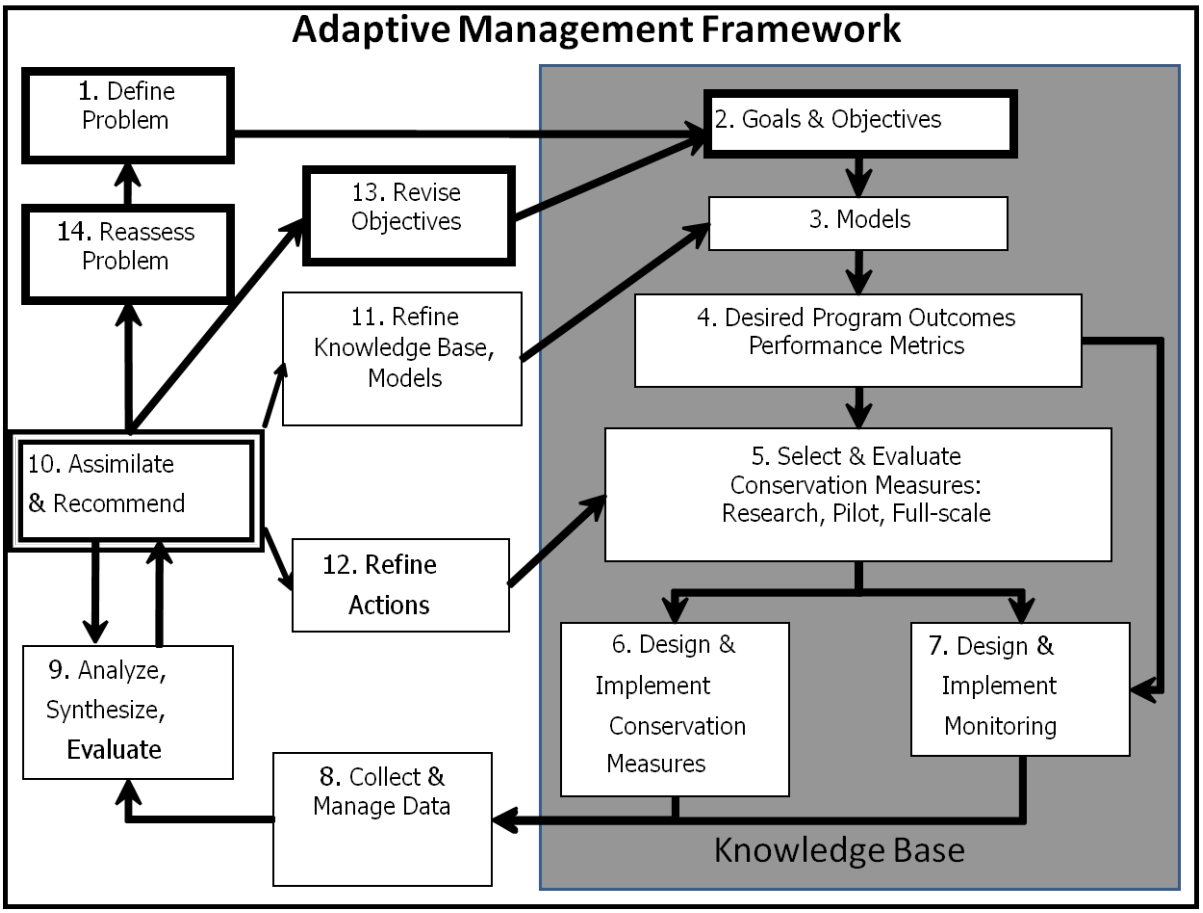

Figure 5. An adaptive management framework. From Dahm et al. (2009).

How well does the Eastern Collier MSHCP conform to these various descriptions, requirements, and principles of adaptive management? Very poorly, in my professional opinion. The discussion of adaptive management in the Plan is brief and vague. It lacks any real substance. The description of monitoring concentrates on compliance monitoring, which is a necessary but not sufficient component of a monitoring program for adaptive management. There is no detailed discussion of what response indicators will actually be measured, or at what intervals and within what statistical design, to evaluate the outcome of alternative policies or management treatments. I must conclude that this HCP exhibits the same basic flaw of the lowest-quality HCPs reviewed by Taylor and Doremus (2015), exhibiting "...monitoring solely to demonstrate compliance with the provisions of the HCP, with no monitoring designed to evaluate the extent to which the plan is achieving its ecological objectives."

The discussion of effectiveness monitoring for panthers is found on pages 116-118. Monitoring is essentially limited to "occurrence data...; habitat selection; movement data; and disease status." All of this monitoring is assigned to FWC: "Based on FWC's experience and existing infrastructure, the applicants propose that FWC be responsible for monitoring panthers within the HCP Area" (Plan, p. 117). This is ostensibly reasonable, but monitoring for adaptive management requires far more than population and habitat surveys – it requires statistically

valid and repeated measurement of the responses of panthers (and other Covered Species) to alternative landscape designs and management treatments (Nichols and Williams 2006). It needs carefully identified "decision-making triggers" to inform adaptive management (Nie and Schultz 2012). Reynolds et al. (2016) pointed out that monitoring programs "risk failure if they lack a clear motivating problem or question, explicit objectives linked to this problem or question, and a comprehensive conceptual model of the system under study." None of these essential elements of adaptive management is present in the Plan. Basically, the Plan lacks a true adaptive management program, a fatal flaw for an HCP, which is legally required to have a rigorous adaptive management component.

Description of monitoring programs for Other Covered Species in the Plan is especially weak. Development of monitoring procedures is mostly deferred to later, for example, "more specific monitoring and reporting requirements will be included in the terms and conditions to the ITPs issued by the USFWS" (Plan, p. 113). This deferral is not acceptable. The adequacy of the monitoring program needs to be evaluated by reviewers now, before the HCP is potentially approved and implemented. A major weakness is that "the periodic accounting of incidental take for other Covered Species will be based on the acreage of other Covered Species habitat(s) impacted by the Covered Activities, as well as the acreage of the in-kind habitat(s) preserved, enhanced, and/or created within the areas designated for Preservation/Plan-Wide Activities and Very Low Density Use under the Plan" (Plan, p. 264). This purely habitat-based monitoring is not sufficient, as populations can fluctuate due to factors not directly related to habitat quality – for example, road mortality. Research has determined that, whereas habitat surrogates are useful for some aspects of monitoring, they are uninformative about population trends of target species over time (Pierson et al. 2015). The applicants need to rigorously monitor population status and trends for the Covered Species. The Plan (p. 264) does state that "biological surveys to determine species status will be conducted as appropriate for the other Covered Species," but not enough detail is provided to determine if the population monitoring program will have a design and statistical power sufficient to determine trends.

As with the panther monitoring approach, the monitoring program for other Covered Species should be formulated and discussed within the theoretical and empirical framework of adaptive management. Why monitor if you're not going to learn and change? Regarding changed and unforeseen circumstances (Chapter 8, beginning p. 268), it would be appropriate to monitor species and ecosystem response to some of the changed circumstances, for instance hurricanes, flooding, fire, and invasive species, pests, and diseases. Although monitoring is mentioned briefly for some of these (invasives), no details are provided. I conclude that the adaptive management and monitoring components of the Eastern Collier MSHCP are entirely unacceptable.

**Major Flaw #4: Inadequate justification for selecting the Preferred Alternative (the Plan) over the PRT Configuration Alternative**

Among the various Plan alternatives discussed in Chapter 10, the No-Action Alternative is dismissed because it is argued it would allow development to impact a potentially greater area

than what is proposed under the Plan, including "development at greater densities [than the base zoning of one unit per five acres] within the 71,275 acres of [Rural Lands Stewardship Area Program] RLSP 'Open' lands located within the HCP area" (Plan, p. 291). According to the Plan, under the proposed HCP, 45,000 acres out of 71,275 acres of "open" lands can be developed, which is apparently 26,000 or more acres less development than would be allowed under the voluntary RLSP (Plan, p. 290).

This statement is potentially misleading, however, because it implies there are sufficient development credits existing in the RLSP to translate into 71,275 acres of intensification. Yet, according to WilsonMiller (now Stantec) in a 2008 memo to Collier County on behalf of the Eastern Collier Property Owners, they determined the existing credits available for intensification in the form of Stewardship Receiving Areas (SRA) "would entitle a maximum of 43,312 acres of SRA development" (WilsonMiller 2008). Any Open Lands over this amount would be limited to the base zoning of one unit per five acres and further protected through the Group 5 Policies in the RLSP, the goal of which is, "Policies that protect water quality and quantity and the maintaining of the natural water regime and protect listed animal and plant species and their habitats on land that is not voluntarily included in the Rural Lands Stewardship Area program" (Collier County 1997-2018). Therefore, policies are in place at the local level for development that is not intensified through participation in the program.

The fact that the current RLSP has capacity for only 43,312 acres of intensification, and has further policies governing development outside of SRA intensification, means that the Plan's proposed 45,000 acres of intensification within the Covered Activities area will result in more new towns or dwellings than could currently be built. While the Plan later acknowledges (Plan, p. 291-292, footnote #52) that "proposed amendments to the Collier County comprehensive plan would place a 45,000-acre cap on development within the RLSA," thus increasing the amount of potential intensification from what it is today, this modification has yet to be made and may not be adopted by the Collier County Commission.

In looking at the current RLSP and the intensification proposed by the Plan, there appears to be little added conservation benefit provided by the HCP beyond the No-Action Alternative, at the cost of authorizing take associated with adding an estimated 91,480 to 112,500 dwelling units, between 174,000 and 290,250 residents, and between 182,960 and 225,000 vehicles to eastern Collier County. This much development might come close to occurring in the absence of a regional HCP, of course, but there is no certainty of this outcome, as each landowner would still have to develop an HCP, or consult under Section 7, to mitigate any incidental take of federally listed species. That said, I still accept the premise that coordinated regional planning – especially if it involves conservation of species of concern that are not federally listed, as well as listed species – is usually superior to piecemeal project-by-project planning. For example, regional conservation planning should reduce habitat fragmentation by clustering development. The important caveat is that development impacts within a regional HCP area must be entirely mitigated, and that the Plan contributes to species recovery (an essential component of a high-quality HCP; Noss et al. 1997). Given road impacts (see above), in particular, I do not believe development impacts are fully mitigated in the current Plan.

The Plan (p. 293) states that "the HCP reflects and furthers the goals of the Florida Panther Protection Plan ('FPPP')." This is certainly not true if increased roadkill resulting from higher traffic volume results in increased mortality of panthers. Moreover, another rejected alternative plan, the Panther Review Team (PRT) Configuration, appears to provide greater benefits to the panther. The Plan (p. 294) states that "the main difference between the PRT Configuration Alternative and the Proposed Alternative is the location of areas designated for Covered Activities." In fact, there is also substantially less protected area in the Plan than within the PRT Configuration.

The reasons given for preferring the HCP over the PRT Configuration are: (1) the PRT "configured the 45,000 acres of potential future development within the RLSP 'Open' areas...However 13,000 acres mapped by the PRT for potential future development are not owned or controlled by the applicants;" (2) "some of the PRT's recommendations are not economically feasible based on land ownership configurations. Some applicants maintain holdings only in areas that the PRT recommended for preservation, yet those applicants possess property and zoning rights that allow for development whether or not the Proposed HCP is implemented;" and (3) "the PRT's recommendations are outdated...Some of the recommendations are no longer available due to planning and permitting activities that have occurred during the years since the PRT recommendation was made. Therefore, the PRT Configuration Alternative would eliminate the interests of some applicants, and is not practicable or viable" (Plan, presumably p. 297, although this page is missing from the Plan, so I had to consult the equivalent page, 291, from the April 2018 draft).

I do not find these reasons for preferring the Plan over the PRT Configuration compelling. While I appreciate the wish to meet the economic needs and desires of the landowner applicants, and that land allocation is complicated by some landowners within the overall Plan area either electing not to be part of the regional HCP or never being invited to join, meeting landowner needs and desires must be done in a way that provides sufficient conservation benefits. The PRT Configuration provides much more land protection than the Plan in areas important to the Florida panther and some other Covered Species. This was noted in an earlier section of this review on the biological significance of the Plan area (see above), where for example, the legends to Figures 2 and 4 specifically noted: "Several areas of Covered Activities (development) in the Eastern Collier MSHCP, especially south of Oil Well Road and in extensive portions of the eastern (e.g., east of SR 29) and western Plan Area, overlap with Priority 1-3 polygons. The PRT Configuration better captures these high-priority areas."

I find it ironic that the Plan states "the PRT's recommendations are not economically feasible..." given the absence of detailed economic analysis in the Plan, for example related to the cost of required mitigation actions and the rate of accumulation of the Marinelli Fund (see above). If some of the landowners hold properties only in the areas recommended for preservation in the PRT Configuration, they have the ability be financially compensated through selling their stewardship credits for development to landowners outside the PRT preservation area. In any case, the PRT Configuration is significantly superior from a biological standpoint to the current

Plan and should be reconsidered as the Preferred Alternative. As for the PRT Configuration being several years out of date, this could be easily remedied by asking the PRT to update its map, given current data.

**Comments on specific topics suggested by the Conservancy of Southwest Florida in relation to the HCP**

Below, I provide a few additional comments in response to specific topics suggested by the Conservancy to consider in my review. Note that most of these topics have been addressed extensively in the sections above.

Adequacy of adaptive management, monitoring, funding mechanisms, and procedures to deal with changed/unforeseen circumstances

I addressed this topic above in two sections. To summarize, the lack of a true adaptive management plan and a detailed monitoring program, as well as insufficient funding (especially in the short term) through the Marinelli Fund, preclude any meaningful response to changed or unforeseen circumstances. The Plan is not adaptive.

If the HCP allows for effective implementation given the lack of Implementing Agreement and number of applicants

I frankly don't know how the present lack of an Implementing Agreement might affect implementation of the Plan. This is not discussed at all in the Plan. Perhaps an Implementing Agreement is being developed? Regarding the number of applicants (11, as stated in the Plan, p. 7), this is not excessively large in comparison to some other HCPs. That said, it would be preferable to have the county act as the lead applicant on behalf of the landowner applicants, as is the case for most of the regional HCPs that I have advised or reviewed in the past.

Adequacy of minimization and mitigation measures for 19 proposed Covered Species

I noted earlier in this review that the Covered Species list includes some species that, given current knowledge, do not occur within the Plan area, or are otherwise inappropriate. Conversely, a number of other species within the Plan area (or documented very near the boundaries) are biologically more threatened than some of the Covered Species, and two of them (orchid species) are listed by the State of Florida as endangered. These should be added to the Covered Species list – and adequately protected.

As noted in the section above on plan alternatives, the PRT Configuration provides more protected land and, therefore, superior minimization and mitigation measures than the Preferred Alternative (the Plan). Moreover, as discussed extensively above, the Plan fails to provide adequate mitigation for the much higher traffic volume that would result from adding approximately 182,960 to 225,000 vehicles to the roads of eastern Collier County.

Protection of the Florida panther, as well as ecosystem functions, corridors, and habitat important to the panther

The Plan considers habitat connectivity for the panther, but does not protect panther corridors as well as the PRT Configuration. The two main needs of the panther in this area, both of which are acknowledged as worthy objectives in the Plan, are (1) construction of wildlife crossings and associated fencing to reduce the likelihood of road mortality, and (2) land acquisition and other measures to protect movement corridors, including movement northward (ultimately across the Caloosahatchee River) to recolonize areas from which panthers have been extirpated. Not enough detail is provided in the Plan on protection of movement corridors. Regarding wildlife crossings, as discussed above, insufficient funds are provided to construct all the crossings that are needed; moreover, the Marinelli Fund will not accrue rapidly enough to construct crossings quickly – prior to development.

Adequacy of description of take to Covered Species, particularly due to traffic and roadway infrastructure

This topic is discussed extensively above. It is my professional opinion that the failure to adequately address and mitigate the take of panthers and other Covered Species as a result of roadkill is the single biggest flaw of the Plan. The Plan fails to even recognize this mortality as take, which in inexcusable.

**Conclusion**

Given the many flaws of the current Eastern Collier MSHCP, as discussed above, I recommend it not be approved. A revised PRT Configuration should be reconsidered, along with complete mitigation of roadkill resulting from increased traffic volume and development of a true adaptive management and monitoring program.

**Literature Cited**

Breininger, D.R., M.J. Mazerolle, M.R. Bolt, M.L. Legare, J.H. Drese, and J.E. Hines. 2012. Habitat fragmentation effects on annual survival of the federally protected eastern indigo snake. Animal Conservation 15:361-368.

Collier County (Planning and Zoning Department). 1997-2018. Collier County Growth Management Plan. Future Land Use Element. https://www.colliercountyfl.gov/home/showdocument?id=83242.

Dahm, C., T. Dunne, W. Kimmerer, D. Reed, E. Soderstrom, W. Spencer, S. Ustin, J. Wiens, and I. Werner. 2009. Bay Delta Conservation Plan Independent Science Advisors' Report on Adaptive Management. Prepared for BDCP Steering Committee. February 2009.

Haddad, N.M., L.A. Brudvig, J. Clobert, K.F. Davies, et al. 2015. Habitat fragmentation and its lasting impact on Earth's ecosystems. Science Advances 2015;1:e1500052.

Harding, E.K., E.E. Crone, B.D. Elderd, J.M. Hoekstra, A.J. McKerrow, J.D. Perrine, J. Regetz, L.J. Rissler, A.G. Stanley, E.L. Walters, and NCEAS Habitat Conservation Plan Working Group. 2001. The scientific foundations of Habitat Conservation Plans: a quantitative assessment. Conservation Biology 15:488-500.

Hoctor, T.S., M.H. Carr, and P.D. Zwick. 2000. Identifying a linked reserve system using a regional landscape approach: the Florida Ecological Network. Conservation Biology 14:984-1000.

Liebesman, L.R., and R. Petersen. 2003. Endangered Species Deskbook. Environmental Law Institute, Washington, D.C.

Morrison, J.L. 2003. Age-specific survival of Florida's crested caracaras. Journal of Field Ornithology 74:321-330.

Mumme, R.L., S.J. Schoech, G.W. Woolfenden, and J.W. Fitzpatrick. 2000. Life and death in the fast lane: demographic consequences of road mortality in the Florida scrub-jay. Conservation Biology 14:501-512.

Nichols, J.D., and B.K. Williams. 2006. Monitoring for conservation. Trends in Ecology and Evolution 21:668-673.

Nie, M.A., and C.A. Schultz. 2012. Decision-making triggers in adaptive management. Conservation Biology 6:1137-1144.

Noss, R.F. 1987. Protecting natural areas in fragmented landscapes. The Natural Areas Journal 7 (1):2-13.

Noss, R.F., and A. Cooperrider. 1994. Saving Nature's Legacy: Protecting and Restoring Biodiversity. Island Press, Washington, D.C.

Noss, R.F., M.A. O'Connell, and D.D. Murphy. 1997. The Science of Conservation Planning: Habitat Conservation under the Endangered Species Act. Island Press, Washington, D.C.

Pierson, J.C., P.S. Barton, P.W. Lane, and D.B. Lindenmayer. 2015. Can habitat surrogates predict the response of target species to landscape change? Biological Conservation 184:1-10.

Rahn, M.E., H. Doremus, and J. Diffendorfer. 2006. Species coverage in multispecies habitat conservation plans: where's the science? BioScience 56:613-619.

Rands, M.R.W., W.M. Adams, L. Bennun, S.H.M. Butchart, et al. 2010. Biodiversity conservation: challenges beyond 2010. Science 329:1298-1303.

Reynolds, J.H., M.G. Knutson, K.B. Newman, E.D. Silverman, and W.L. Thompson. 2016. A road map for designing and implementing a biological monitoring program. Environmental Monitoring and Assessment 188:399: doi 10.1007/s10661-016-5397-x.

Taylor, M., and H. Doremus. 2015. Habitat Conservation Plans and climate change: recommendations for policy. Environmental Law Reporter 45:10863-10874.

U.S. General Accounting Office. 1994. Endangered Species Act: Information on Species Protection on Nonfederal Lands. GAO/RCED-95-16.

U.S. Fish and Wildlife Service. 2000. The HCP Handbook Addendum or "Five Point Policy." http://www.fws.gov/Midwest/Endangered/permits/documents/HCPAddendum.pdf.

U.S. Fish and Wildlife Service. 2011. Habitat conservation plans under the Endangered Species Act. Fact Sheet: http://www.fws.gov/endangered/esa-library/pdf/hcp.pdf.

Wilhere, G.F. 2002. Adaptive management in Habitat Conservation Plans. Conservation Biology 16:20-29.

WilsonMiller. 2008 (September 18, 2008). Estimates of Stewardship Credits under the current and revised RLSA Program and recommendation for Credit calibration. Appendix H. https://www.colliercountyfl.gov/home/showdocument?id=22276.

# *CURRICULUM VITAE*

**Reed Frederick Noss, Ph.D.**
Naturalist, Ecologist, Conservation Biologist, Writer, Photographer
Elected Fellow, American Association for the Advancement of Science
https://en.wikipedia.org/wiki/Reed_Noss

*Home and Office:*
Florida Institute for Conservation Science
Conservation Science, Inc.
1255 East Peppertree Drive, Apt. 407
Sarasota, FL 34242
CELL: (407) 489-5778
Email: reed.noss@segrasslands.org, reedfnoss@gmail.com, noss_r@bellsouth.net

***Summary***

Primary interests and research include topics in biogeography; fire and other disturbance ecology; natural history; conservation planning; climate change ecology; ornithology; landscape and community ecology; forest, grassland, and shrubland ecology and management; herpetology; carnivore ecology; road ecology; biological inventory and monitoring.

Education includes a B.S. in Biology and Health Education (University of Dayton), graduate study in Environmental Education (Antioch College), a M.S. in Ecology (University of Tennessee), and a Ph.D. in Wildlife Ecology (University of Florida).

Professional experience includes field biological research, university teaching, animal and plant population and habitat surveys, conservation assessments and planning, environmental review, land management, natural history interpretation, research administration, staff supervision, writing, and editing. Professional service includes Editor-in-Chief, *Conservation Biology* (1993-1997), President of the Society for Conservation Biology (1999-2001), President of the North America Section of the Society for Conservation Biology (2006-2008), Governor-appointed member of the State of Florida's Acquisition and Restoration Council (2006-2007), and Vice Chair, Adaptation for Climate-Sensitive Ecosystems and Resources Advisory Committee, U.S. Climate Change Science Program (2007-2009).

***Employment***

1990-present. **Writer, Consultant, Photographer, Lecturer, and Expert Witness in Conservation Biology, Ecology, and Natural History**

2018-present. **Chief Science Advisor**, Endangered Ecosystems Alliance, Vancouver, B.C., Canada

2017-present. **Chief Science Advisor**, Southeastern Grasslands Initiative, Austin Peay State University, Clarksville, TN

1999-present. **Chief Scientist**, Conservation Science, Inc. Corvallis, Oregon, and Chuluota, Florida

2002-2017. **Provost's Distinguished Research Professor, Davis-Shine Professor of Conservation Biology**, and **Pegasus Professor**, University of Central Florida, Department of Biology, Orlando, Florida

2005-2017. **Director, Science and Planning In Conservation Ecology (SPICE) Laboratory**, University of Central Florida, Orlando, Florida

2002-2004. **Chief Scientist**, The Wildlands Project, Richmond, Vermont

2000-2002. **Adjunct Professor and Courtesy Professor**. Department of Biology, University of Oregon. Eugene, Oregon

1997-2005. **Courtesy Professor**, Department of Forest Science, Oregon State University, Corvallis, Oregon

1994-2005. **Courtesy Associate Professor,** Department of Fisheries and Wildlife, Oregon State University, Corvallis, Oregon

1995-2002. **Instructor**, Department of Exercise and Sport Science, Oregon State University, Corvallis, Oregon (taught martial arts)

1989-2005. **Adjunct Professor,** The Union Institute, University of Cincinnati, Cincinnati, Ohio

1997-1999. **Chief Scientist,** The Conservation Biology Institute. Corvallis, Oregon

1993-1997. **Editor**, *Conservation Biology*. Society for Conservation Biology

1991-1997. **Research Associate**, Stanford University, Center for Conservation Biology

1991-1996. **Research Scientist**, University of Idaho, College of Forestry (half-time appointment, National Biological Service; on paid leave Sept. 1993-May 1996 as a Pew Scholar in Conservation)

1992-1996. **Science Director**, The Wildlands Project, Tucson, AZ

1989-1994. **Courtesy Assistant Professor,** Department of Fisheries and Wildlife, Oregon State University

1988-1990. **Biodiversity Project Leader,** U.S. Environmental Protection Agency, Environmental Research Lab, Corvallis, Oregon

1984-1988. **President and Ecologist,** Landscape Ecosystems (consulting firm), Gainesville, Florida

1987-1988. **Staff Ecologist**, KBN Engineering & Applied Sciences, Inc., Gainesville, Florida

1988. **Adjunct Faculty**, Santa Fe Community College, Gainesville, Florida (Biology Instructor)

1987. **Associate Faculty**, School for Field Studies, Beverly, Massachusetts (taught two summer field ecology courses in San Juan Mountains of Colorado)

1984-1987. **Graduate Research Assistant**, University of Florida, Gainesville, FL

1983-1984. **Managed Area Specialist**, Florida Natural Areas Inventory, The Nature Conservancy, Tallahassee, FL

1981-1983. **Ecologist**, Ohio Natural Heritage Program, Ohio Dept. of Natural Resources, Division of Natural Areas & Preserves, Columbus, Ohio

1980-1981. **Naturalist**, Ohio Dept. of Natural Resources, Division of Parks & Recreation

1979. **Field Biologist;** contracts included: (1) survey of herpetofauna and avifuana in proposed state natural areas for Tennessee Natural Heritage Program; (2) survey and discovery of gray bat maternity colonies in Kentucky for U.S. Fish & Wildlife Service

1977-1979. **Graduate Teaching Assistant**, University of Tennessee (Knoxville); taught General Biology and General Ecology

1978. **Ecological Consultant in Nicaragua**. Land-use and national park planning, avian and herpetological surveys and collecting

1972-1977. **Environmental Education**, several jobs: (1) Science Director for youth camp in Ontario (3 summers); (2) Teacher-naturalist at Glen Helen Outdoor Education Center, Antioch College (1 year); (3) Naturalist for youth camp in Ohio (1 summer); (4) Naturalist for Ohio Historical Society at Cedar Bog State Preserve (2.5 years, part-time)

***Education***

1988. Ph.D. Department of Wildlife & Range Sciences, School of Forest Resources & Conservation, University of Florida. Cumulative GPA = 4.00

1979. M.S. Graduate Program in Ecology, University of Tennessee, Knoxville. Cumulative GPA = 3.96

1975-1976. Graduate School of Education, Antioch College, Yellow Springs, Ohio. 15 graduate hours in outdoor education

1975. B.S. School of Education, University of Dayton, Ohio. Final GPA = 3.78

***Honors and Awards***

2014. Pegasus Professor, University of Central Florida. This is the university's highest award for faculty and considers research, teaching, and service.

2014. Keiser Distinguished Lecturer Award, Ohio Northern University

2012. Benton H. Box Award of the George B. Hartzog, Jr. Environmental Awards Program, Department of Parks, Recreation, and Tourism Management, Clemson University

2011. Outstanding Alumnus Award, University of Florida, Department of Wildlife Ecology and Conservation

2010. Conservation Leadership Award, Wilburforce Foundation

2006. Identified by ISI HIGHLYCITED.COM (Thomson Scientific) as one of the 500 most highly cited authors in all fields during the preceding review decade (1993-2003). Also ranked as within the top 250 most-cited authors in the "ecology and environment" field

2002. Wildlife Publications Award, Outstanding Edited Book Category, The Wildlife Society (for Maehr, Noss, and Larkin, *Large Mammal Restoration*)

2001-present. Elected Fellow, American Association for the Advancement of Science

1999-present. Elected Scientific Fellow, Wildlife Conservation Society

1995. Edward T. LaRoe III Memorial Award of the Society for Conservation Biology

1995. Conservation Community Award for Outstanding Achievement in the Field of Publications, Natural Resources Council of America (for Noss and Cooperrider, *Saving Nature's Legacy*)

1993-1996. Pew Scholars Fellowship in Conservation and the Environment

1988. Environmental Publication Award, National Wildlife Federation

1987. President's Recognition Award, University of Florida

1986. Annual Research Award, Alachua Audubon Society

1986. Annual Research Award, Frank M. Chapman Memorial Fund, American Museum of Natural History

1986. Annual Research Award, Josselyn Van Tyne Memorial Fund, American Ornithologists' Union

1985. Annual Research Award, Florida Ornithological Society

1984-1987. Graduate Research Fellowship, School of Forest Resources and Conservation, University of Florida

***Avocations***

Birding, field botany, natural history, nature photography, hiking, canoeing, music, karate (7th degree black belt and master instructor, Hayashi-ha Shito-ryu), kobudo (Yamanni-Chinen ryu, traditional Okinawan weaponry, 3rd degree black belt), tai chi chu'an, qi gong, hatha yoga, and more.

***Professional Society Memberships***

Ecological Society of America (since 1977)
The Natural Areas Association (since 1981)
Society for Conservation Biology (since 1987)
Association for Fire Ecology
American Association for the Advancement of Science
American Ornithological Society

***Professional Appointments and Service***

2006-present. President and Chief Scientist, Florida Institute for Conservation Science, Chuluota, Florida

2018-present. Steering Group, Global Ecocentric Network for Implementing Ecodemocracy (GENIE)

2018-present. Courtesy Professor. Department of Wildlife Ecology and Conservation, University of Florida, Gainesville

2017-present. Visiting Scholar, Nicholas School of the Environment, Duke University, Durham, NC

2016-present. Member, World Commission on Protected Areas, Connectivity Conservation Specialist Group, IUCN, Gland, Switzerland

2015-present. Member, World Commission on Protected Areas, Mountains Specialist Group, IUCN, Gland, Switzerland

2010-present. Member, World Commission on Protected Areas, North America and Caribbean Region, IUCN, Gland, Switzerland

2018-present. Advisor, Nature Needs Half Network, Boulder, CO

2017-present. Member, Advisory Board, Mockernut Hill Botanical Garden, Shiloh, FL

2017-present. Senior Consultant, Biodiversity Unlimited Consulting and Research Group, LLC

2017-present. Member, Advisory Council, Natural History Institute, Prescott, AZ

2016-present. Member, Advisory Board, Conservation Trust for Florida

2015-present. Member, Chairman’s Council, Board of Trustees, Florida Chapter, The Nature Conservancy

2015-present. Member, Technical Advisory Group, IntAct: International Action for Primary Forests

2015-present. Member, Advisory Panel (AP), Quick Response Biodiversity Fund (QRBF), RESOLVE

2013-present. Member, Scientific Advisory Council, Peninsula Open Space Trust, Palo Alto, California

2011-present. Member, Editorial Board, *Journal of Natural History Education and Experience*

2016-2017. Member, Board of Directors, Allen Broussard Conservancy, Inc. (Forever Florida)

2008-2016. Associate Editor, *Conservation Letters*

2008-2016. Member, Technical Advisory Group, Critical Lands and Waters Identification Project (CLIP), State of Florida

2003-2015. Member, Science and Publications Committee, Society for Conservation Biology (Chair, Publications Committee, 2003-2005)

2012-2014. Member, Executive Board, Florida Climate Institute, State University System of Florida.

1998-2012. Consulting Editor, *Conservation Biology*

2006-2012. Member, Science Advisory Board, National Research Council, Academy of Finland

2009-2012. Member, Advisory panel to U.S. National Park Service on animal migrations and new national park designations

2011. Science Advisor, Terrestrial Impacts of Mountaintop Mining, U.S. Environmental Protection Agency, Philadelphia, PA

2010-2011. Science Advisor, Desert Renewable Energy Conservation Plan, California Department of Energy, Sacramento, California

2007-2009. Vice-Chair, Adaptation for Climate-Sensitive Ecosystems and Resources Advisory Committee, U.S. Climate Change Science Program

2003-present. Member, Science and Conservation Advisory Board, Lava Lake Land & Livestock, L.L.C., Hailey, Idaho

2007-2013. Member, Steering Committee and Technical Committee, Florida Bird Conservation Initiative, Florida Fish and Wildlife Conservation Commission

2002-2014. Member, Florida Grasshopper Sparrow Working Group (interagency); Chair of Working Group 2002-2008

2009-present. Vice-President, Japan Karatedo Hayashi-Ha Shitoryu-Kai of North America

2008-2014. Member, Science Advisory Committee, Alberta Biodiversity Monitoring Institute

2007-2010. Science advisor (Focus Group member) to Secretary Tom Pelham, Florida Department of Community Affairs

2003-2009. President, Conservation Planning Institute, Corvallis, Oregon

1992-2008. Member, Board of Governors, Society for Conservation Biology

2004-2008. Editor, Special Publications, and Member, Board of Directors, Florida Ornithological Society

2006-2008. President, North America Section, Society for Conservation Biology

2006-2007. Member, Acquisition and Restoration Council (ARC). Appointed by Governor Jeb Bush. (This is the decision-making body for conservation land acquisitions and management plans in Florida)

2005-2007. Lead Science Advisor, Great Sand Hills Regional Environmental Study (Environment Saskatchewan)

2006-2007. Leader, Science Advisory Panel, East San Diego County (California) Natural Community Conservation Plan and Habitat Conservation Plan

2005-2006. Member, Board of Professional Certification, Ecological Society of America

2005-2006. Member, Steering Committee, Naturally Central Florida, myregion.org

2004-2006. Member, Board of Trustees, Florida Chapter, The Nature Conservancy

2005-2006. Member, Science Advisory Panel, Yolo County (California) Natural Community Conservation Plan and Habitat Conservation Plan

2005-2006. Member, Science Advisory Panel, Yuba and Sutter Counties (California) Natural Community Conservation Plan and Habitat Conservation Plan

2004-2005. Member, Strategic Planning Committee, Society for Conservation Biology

2004-2009. Member, Canadian Boreal Initiative and BEACONS Science Advisory Committee, Ottawa, Ontario, and Edmonton, Alberta

2002-2005. Member, Florida Forever Work Group, Florida Natural Areas Inventory, Florida State University (Tallahassee, FL)

2002-2006. Member, Brevard County Conservation Working Group (Brevard County, FL)

2003-2007. Member, Conservation Committee, Florida Native Plant Society

2003-2006. Member, Advisory Group, Grassland Conservation Network of North America, The Nature Conservancy (Boise, ID) and the Center for Environmental Cooperation (Montreal, Quebec)

2002-2009. Member, Science Advisory Committee, Two Countries One Forest (Northern Appalachians and Southern Canadian Shield Conservation Network, (Montreal, Quebec)

1998-2005. Science Advisory Panel. Weyerhaeuser Corporation, Coastal British Columbia Group, Nanaimo, B.C.

2003. Leader, Science Advisory Panel, Mendocino Redwoods Natural Community Conservation Plan and Habitat Conservation Plan (Mendocino County, California)

2002. Leader, Science Advisory Panel, Solano County Natural Community Conservation Plan and Habitat Conservation Plan

2002. Leader, Science Advisory Panel, Eastern Merced County (California) Natural Community Conservation Plan and Habitat Conservation Plan

2001. Leader, Science Review Team, North San Diego County (California) Multi-Species Conservation Plan

2001. Leader, Science Advisory Team, Coachella Valley Multiple Species Habitat Conservation Plan, The Nature Conservancy, U.S. Fish and Wildlife Service, and Coachella Valley Mountains Conservancy, Palm Desert, CA

2000-2002. Chair, Forest Work Group and Member, Design Committee. State of the Nation's Ecosystems project, The H. John Heinz III Center for Science, Economics, and the Environment, Washington, D.C.

1999-2001. President, Society for Conservation Biology

2000-2001. Member, Advisory Panel for Implementation of "High Conservation Value Forests" and "The Precautionary Principle," Forest Stewardship Council, Oaxaca, Mexico

1999-2001. Scientific Advisor, Pima County Habitat Conservation Plan, Tucson, AZ

1997-1999. Leader, Science Team for Master Plan. Save-the-Redwoods League, San Francisco, CA

1998-2000. Leader. Scientific Panel for Review of Material Relevant to the Occurrence, Ecosystem Role, and Tested Management Options for Mountain Goats in Olympic National Park. U.S. Department of Interior

1999. Chair. Kanab Ambersnail Scientific Review Panel. Arizona Department of Game and Fish

1991-1996, 1999-2001. Co-founder and Member of Board of Directors, The Wildlands Project

1990-2002. Member, State of Oregon Habitat Conservation Trust Fund Board

1996-present. Science Advisor, World Resources Institute

1992-present. Member, Advisory Board, The Ecoforestry Institute

1992-present. Member, Scientific Advisory Board, Conservation International

1993-present. Member, Advisory Board, Oregon Natural Desert Association

1993-present, Member, Advisory Board, Coast Range Association (Corvallis, Oregon)

1994-present. Member, Science Advisory Board, Defenders of Wildlife

1993-1997. Editor-in-Chief, *Conservation Biology*

1992-2000. Member, Board of Directors, Wild Earth Society

1993-1996. Member, Board of Directors, Natural Areas Association

1993. Member, Old-growth Ecosystem Panel for Northwest Forest Ecosystem Team advising President Clinton on forest management options

1993-1996. Member, Committee on the Scientific Basis for Ecosystem Management, Ecological Society of America

1994-1996. Member, Ad Hoc Committee to Revise Criteria for Selection of Biosphere Reserves, USMAB, U.S. Department of State

1991-2012. Member, Board of Editors, *Conservation Biology*

1991-2005. Science Editor, *Wild Earth*

1991-1994. Member, Natural Community Conservation Planning Scientific Review Panel (appointed by Governor Wilson of California)

1990-1991. Member, World Wildlife Fund Advisory Committee on Habitat Conservation Plans

1989-1991. Professional Participant, Keystone Center National Policy Dialogue on Biological Diversity

1988-1993. Subject Matter Editor, Landscape Ecology, Board of Editors, *The Natural Areas Journal*

1984-present. Peer reviewer for *Science, American Naturalist, Ecology, Ecology Letters, Trends in Ecology and Evolution, Conservation Biology, Biological Conservation, Conservation Letters, Ecological Applications, Journal of Wildlife Management, Environmental Management, The Natural Areas Journal,*

*BioScience, The Environmental Professional, Landscape Ecology, Ecography, Oikos, Oecologia, Landscape and Urban Planning, PloS One, Animal Conservation, Journal of Natural History, Journal of Natural History Education and Experience, Castanea, Biological Reviews*, *Diversity and Distributions, American Journal of Botany, Annals of Botany*, and others

***Courses Taught***

*School for Field Studies*: Field Ecology in San Juan Mountains (co-taught), 1987
*University of Florida*: Field Techniques in Wildlife Ecology (co-taught), 1988
*Santa Fe Community College*: General Biology, 1988
*U.S. Bureau of Land Management, U.S. Forest Service, U.S. Fish and Wildlife Service, U.S. National Park Service*: many short-courses on biodiversity, endangered species, and ecosystem management (co-taught), 1988-1999
*Oregon State University* (Dept. of Fisheries and Wildlife): Conservation Biology, 1994
*Oregon State University* (Dept. of Exercise and Sport Science): Karate, 1995-2002 (every quarter)
*University of Oregon* (Dept. of Biology): Conservation Biology, 2000
*University of Central Florida* (Dept. of Biology): Seminar in Conservation Biology (2003); Conservation Planning (2003); Field Botany (2003); History of Ecology and Conservation Biology (2004, 2006); Ornithology (2005); Field Ornithology (2004, 2007, 2010, 2014); Conservation Biology Theory (2004, 2005, 2006, 2007, 2008, 2010, 2012, 2014, 2016); Conservation Biology Practice (2006); Ecosystems of Florida (2013, 2015)

***Invited Lectures, Seminars, and Presentations***

Average of >1 monthly since ca. 1990 (i.e., too numerous to list).

***Graduate Theses and Dissertations Supervised***

1997 Carlos Carroll. Predicting the distribution of the fisher (*Martes pennanti*) in northwestern California, U.S.A. using survey data and GIS modeling. M.S., Department of Fisheries and Wildlife, Oregon State University.

1999 Kenneth W. Vance-Borland. Physical habitat classification for conservation planning in the Klamath Mountains region. M.S., Department of Fisheries and Wildlife, Oregon State University.

2000 Carlos Carroll. Spatial modeling of carnivore distribution and population viability. Ph.D., Department of Forest Science, Oregon State University.

2002 Paul Adamus. Winter habitat relationships of birds in wetlands in the Willamette Valley, Oregon. Ph.D., Department of Fisheries and Wildlife, Oregon State University.

2004 Robin Bjork. Intratropical migration of the Mealey Parrot (*Amazona farinosa*) in Guatemala: implications for conservation. Ph.D., Department of Fisheries and Wildlife, Oregon State University.

2006 Julia Noran. Effects of patch size and matrix type on bird assemblages within central Florida cypress domes. M.S., Department of Biology, University of Central Florida.

2008 Danielle Munim Eisenberg. The distribution, abundance, and habitat use of the Big Cypress fox squirrel (*Sciurus niger avicennia*). M.S., Department of Biology, University of Central Florida.

2008 Robert Aldredge. Costs and benefits of early incubation onset in the Florida Scrub-Jay (*Aphelocoma coerulescens*). M.S., Department of Biology, University of Central Florida.

2009 David Breininger. Landcover change and population dynamics of Florida Scrub-Jays and Florida Grasshopper Sparrows. Ph.D., Department of Biology, University of Central Florida.

2009 Jill Aldredge. Factors affecting breeding territory size and placement for the Florida Grasshopper Sparrow (*Ammodramus savannarum floridanus*). M.S., Department of Biology, University of Central Florida.

2013 Joyce M. Klaus. Wetland diversity in a disturbance-maintained landscape: Effects of fire and a fire surrogate on aquatic amphibian survival and species richness. Ph.D., Department of Biology, University of Central Florida

2013 Marianne Korosy. Estimated diets, diet overlap, and winter habitat associations of four grassland sparrows in Florida dry prairie. Ph.D., Department of Biology, University of Central Florida

2013 Angela Tringali. Plumage color in a cooperative breeding bird: behavior, genetics, and ecological differences. Ph.D., Department of Biology, University of Central Florida

2013 Pamela Pannozzo. Florida local government conservation planning: variability, drivers, and policy implications. Ph.D., Department of Biology, University of Central Florida

2017 Joe Figel. Cross-continental insights into jaguar (*Panthera onca*) ecology and conservation. Ph.D., Department of Biology, University of Central Florida

2017 Molly Grace. The behavior of humans and wildlife with respect to roads: insights for mitigation and management. Ph.D., Department of Biology, University of Central Florida

Postdoctoral Fellows supervised at University of Central Florida: Dr. Daniel Smith, Dr. Robin Bjork, Dr. Joshua Reece

***Major (> $50,000) Grant-Funded Projects Directed as Principal Investigator or Co-P.I. Since 1995***

2012-2015. $442,526. Roadside Animal Detection System (RADS) for Florida Panther, Collier County, Florida. Funder: Florida Department of Transportation.

2011-2014. $700,000. Adaptation to Sea Level Rise in Florida: Biological Conservation Priorities. Funder: The Kresge Foundation.

2011-2014. $150,000. Predicting and Mitigating the Effects of Sea Level Rise and Land Use Change on Imperiled Species and Natural Communities in Florida. Funder: Florida Fish and Wildlife Conservation Commission.

2011-2013. $349,994. State Road 40 Pre-Construction Wildlife Movement Monitoring: Areas A, B and F. Funder: Florida Department of Transportation.

2008-2010. $183,804. Cost-Effective Wildlife Crossing Structures which Minimize the Highway Barrier Effects on Wildlife and Improve Highway Safety along US 64, in Tyrell County, North Carolina. Funder: North Carolina Department of Transportation.

2008. $100,000. Investigation of Secondary Impacts to Selected Focal Species from Proximity to Recreation Facilities on Lands Managed by the Southwest Florida Water Management District. Funder: Southwest Florida Water Management District.

2007-2010. $517,563. Continuation and Expansion of Study of Actual and Potential Wildlife Crossing Structures in Central Florida, Refinement of Standards for Culvert Design, and Evaluation of the Effectiveness of Wildlife Fence/Barrier Materials. Funder: Florida Department of Transportation.

2006. $79,000. Continuation of Reconnaissance Study of Actual and Potential Wildlife Crossing Structures in Central Florida, Refinement of Standards for Culvert Design (Project No. BC354-34), and Evaluation of the Effectiveness of Wildlife Fence/Barrier Materials. Funder: Florida Department of Transportation.

2006-2008. $290,076. General Operations and Capacity-Building, SPICE (Science and Planning In Conservation Ecology) Laboratory. Funder: M.C. Davis, Nokuse Plantation, Inc., and Sam M. Shine Foundation, Inc.

2005-2008. $615,594. An Investigation of Breeding Ecology, Metapopulation Dynamics, Winter Ecology, and Recovery Potential of Florida Grasshopper Sparrows (*Ammodramus savannarum floridanus*) at Kissimmee Prairie Preserve State Park and the Broader Landscape Linking it to Other Currently Inhabited Sites and Potential Reintroduction Sites. Funder: U.S. Fish and Wildlife Service.

2005-2006. $173,000. Great Sand Hills Regional Environmental Study Natural Capital Baseline Assessment. Funder: Environment Saskatchewan, via University of Regina. (renewed at same level of funding for 2006-2007 but channeled through the Conservation Planning Institute, Corvallis, OR)

2005-2006. $103,000. East Collier County Wildlife Movement Study –SR 29, CR 846, CR 858 Wildlife Crossing Project. Funder: National Wildlife Federation and other private funders.

2004-2006. $75,724. A Reconnaissance Study of Actual and Potential Wildlife Crossing Structures in Central Florida. Funder: Florida Department of Transportation.

2004-2005. $124,839. Nokuse Wildlife Corridor and US-331 Wildlife and Hydrological Crossings Study. Funder: M.C. Davis, Nokuse Plantation, Inc.

2004-2005. $76,578. An Integration of Restoration Ecology and Conservation Biology for Recovery of Ecological Integrity in a Ponderosa Pine Landscape. Funder: Ecological Restoration Institute, Northern Arizona University.

1999-2001. $215,000. Conservation Assessment for Greater Yellowstone Ecosystem and Utah-Wyoming Rocky Mountains Ecoregion. Funders: The Nature Conservancy, Greater Yellowstone Coalition, Doris Duke Foundation

1997-2002. $343,000. Rocky Mountain Carnivores Conservation Assessment. Funders: World Wildlife Fund Canada, The Nature Conservancy, Yellowstone to Yukon Conservation Initiative, Kendall Foundation, Wilburforce Foundation

1995-1999. $170,000. Conservation Plan for Klamath-Siskiyou Ecoregion. Funders: W. Alton Jones Foundation, David and Lucille Packard Foundation, Foundation for Deep Ecology

***Professional References (order is alphabetical)***

Dr. Eric Dinerstein, Director, Biodiversity and Wildlife Solutions, RESOLVE, 1255 23rd St. NW, Suite 275, Washington, DC 20037, (202) 965-6382, edinerstein@resolv.org

David Lindenmayer, Professor, Centre for Resource and Environmental Studies, The Australian National University, Canberra, ACT, 0200, Australia, +61 2 61250654, David.Lindenmayer@anu.edu.au

Dr. Martin B. Main, Associate Dean and Program Leader, Extension Natural Resources and Assistant Director, Florida Sea Grant, University of Florida, 1762 McCarty Drive, Building 803, PO Box 110405, Gainesville, FL 32611-0430, (352) 392-1837, mmain@ufl.edu

Dr. Michael Soulé, Research Professor Emeritus of Environmental Studies, University of California, Santa Cruz, c/o 212 Colorado Ave., Paonia, CO 81428, (970) 527-4719, msoule36@gmail.com

Dr. Gary M. Tabor, Director, Center for Large Landscape Conservation, P.O. Box 1587, Bozeman, Montana 59771, (406) 600-7030, wildcatalyst@gmail.co

Dr. David Wilcove, Professor, Woodrow Wilson School, Robertson Hall, Princeton University, Princeton, NJ 08544, (609) 258-7118, dwilcove@princeton.edu

***PUBLICATIONS***

***Publication Summary***

Books: 8 plus 1 in preparation
Refereed Journal Articles: 107
Journal Articles in Review, Revision, or Preparation: 8
Book Chapters: 63
Technical Reports: 78
Other Articles (magazine articles, editorials, book reviews, etc.): 73

**Total: 329 published or in press + 9 in review, revision, or preparation**

**Google Scholar lifetime citations: 30,250 as of November 16, 2018**
**h-index: 74**
**i10-index: 154**
**ResearchGate RG Score: 43.29**

***Books***

Noss, R.F. In preparation. Endangered Ecosystems of the United States and Canada: How We Might Save Them.

Noss, R.F. 2018. Fire Ecology of Florida and the Southeastern Coastal Plain. University Press of Florida, Gainesville.

Noss, R.F. 2013. Forgotten Grasslands of the South: Natural History and Conservation. Island Press, Washington, D.C.

Noss, R.F., editor. 2006. Land of Fire and Water: The Florida Dry Prairie Ecosystem. Proceedings of the Florida Dry Prairie Conference. E.O. Painter, De Leon Springs, FL.

Maehr, D., R. Noss, and J. Larkin, editors. 2001. Large Mammal Restoration: Ecological and Sociological Challenges for the 21st Century. Island Press, Washington, D.C.

Noss, R.F., editor. 2000. The Redwood Forest: History, Ecology, and Conservation of the Coast Redwoods. Island Press, Washington, D.C.

Pimentel, D., L. Westra, and R. Noss, editors. 2000. Ecological Integrity: Integrating Environment, Conservation, and Health. Island Press, Washington, D.C.

Noss, R.F., M.A. O'Connell, and D.D. Murphy. 1997. The Science of Conservation Planning: Habitat Conservation under the Endangered Species Act. Island Press, Washington, D.C.

Noss, R.F., and A. Cooperrider. 1994. Saving Nature's Legacy: Protecting and Restoring Biodiversity. Island Press, Washington, D.C.

***Refereed Journal Articles in Review, Revision, or Preparation***

Thorn, S., S. Seibold, A. Leverkus, J. Müller, R. Noss, N. Stork, S. Vogel, and D. Lindenmayer. In revision. Neglected forest degradation must be stopped to reach Aichi targets. Nature Sustainability.

Lepczyk, C.A., D.C. Duffy, D.M. Bird, M. Calver, L. Cherkasky, C.R. Dickman, S. Hess, D. Jessup, T. Longcore, S. Loss, K.A.T. Loyd, P.P. Marra, J. Marzluff, R.F. Noss, D. Simberloff, G. Sizemore, S.A. Temple, and Y. van Heezik. In revision. A science-based policy for managing free-ranging cats. Conservation Letters.

Figel, J.J., G. Forero-Medina, J.D. Sánchez-Londoño, S. Botero-Cañola, L. Valenzuela, and R.F. Noss. In review. Swamp cats: Jaguars prefer wetlands within an intercontinental corridor threatened by pasture and oil palm development. Oryx.

E. Castaneda, M. Grace, V. Leavings, and R. Noss. In review. Preliminary findings on the effects of traffic noise on tadpole behavior and development. Journal of Undergraduate Research.

Jenkins, D.G., E.H. Boughton, R.F. Noss, A.J. Bohonak, M.A. Simovich, and E.T. Bauder. In preparation. Are good conservation shortcuts hard to find?

Noss, R.F., J.S. Reece, M. Volk, T. Hoctor, P. Zwick, M. Carr, and J. Oetting. In preparation. Population growth and sea-level rise on a collision course in Florida: consequences for biodiversity and ecosystem services.

J.K. Costanza, W.J. Platt, and R.F. Noss. In preparation. Landscape assessment of habitat loss: a new approach for a global biodiversity hotspot.

Sorrie, B.A., W.J. Platt, A.S. Weakley, D.B. Means, J. Costanza, R.F. Noss, and R.K. Peet . In preparation. The Atlantic and Gulf Coastal Plain Floristic Province: a global biodiversity hotspot. To be submitted to Castanea (special issue).

***Refereed Journal Articles (Published or In Press)***

Figel, J.J., F. Castañeda, A.P. Calderón, J.A. de la Torre, E. García-Padilla, and R.F. Noss. 2018. An evaluation of jaguar (*Panthera onca*) as an umbrella species for endemic herpetofauna in nuclear Central America. Revista de Biologia Tropical (International Journal of Tropical Biology) 66:in press.

Müller, J., R.F. Noss, S. Thorn, C. Bässler, A. Leverkus, and D. Lindenmayer. 2018. Increasing disturbance demands new policies to conserve intact forest. Conservation Letters. doi.org/10.1111/conl.12449.

Peters, R., W.J. Ripple, C. Wolf, M. Moskwik, G. Carreón- Arroyo, G. Ceballos, A. Córdova, R. Dirzo, P.R. Ehrlich, A.D. Flesch, R. List, T.E. Lovejoy, R.F. Noss, J. Pacheco, J.K. Sarukhán, M.E. Soulé, E.O. Wilson, J.R.B. Miller, and scientist signatories. 2018. Nature divided, scientists united: U.S.-Mexico border wall threatens biodiversity and binational conservation. BioScience https://doi.org/10.1093/biosci/biy063.

Lindenmayer, D., S. Thorn, and R. Noss. 2018. Countering resistance to protected area extension. Conservation Biology 32:315-321.

Baldwin, R.F., S.C. Trombulak, P.B. Leonard, R.F. Noss, J.A. Hilty, H.P. Possingham, L. Scarlett, and M.G. Anderson. 2018. The future of landscape conservation. BioScience 68:60–63. doi.org/10.1093/biosci/bix142.

Grace, M.K., and R.F. Noss. 2018. Evidence for selective avoidance of traffic noise by anuran amphibians. Animal Conservation. doi:10.1111/acv.12400.

Johns, D., J. Terborgh, K.F. Beazley, J.A. Estes, D. Foreman, B. Miller, R. Noss, M. Soulé, and W.J. Ripple. 2017. We need a biologically sound North American conservation plan. BioScience 67:685-686.

Grace, M.K., D.J. Smith, and R.F. Noss. 2017. Reducing the threat of wildlife-vehicle collisions during peak tourism periods using a Roadside Animal Detection System. Accident Analysis and Prevention 109:55-61.

Cafaro, P., T. Butler, E. Crist, P. Cryer, E. Dinerstein, H. Kopnina, R. Noss, J. Piccolo, B. Taylor, C. Vynne, and H. Washington. 2017. A reply to 'Half-Earth or Whole Earth? Radical ideas for conservation, and their implications. Oryx. DOI: 10.1017/S0030605317000072.

Grace, M.K., D.J. Smith, and R.F. Noss. 2017. Roadside abundance of anurans within a community correlates with reproductive life history. Frontiers in Ecology and Evolution. doi: 10.3389/fevo.2017.00065.

Noss, R.F. 2017. Becoming ecocentric. Ecological Citizen 1(Suppl A):30-32.

Dinerstein, E., D. Olson, A. Joshi, C. Vynne, N.D. Burgess, E. Wikramanayake, N. Hahn, S. Palminteri, P. Hedao, R. Noss, M. Hansen, H. Locke, E.C. Ellis, B. Jones, C.V. Barber, R. Hayes, C. Kormos, V. Martin, E. Crist, W. Sechrest, L. Price, J.E.M. Baillie, D. Weeden, K. Suckling, C. Davis, N. Sizer, R. Moore, D. Thau, T. Birch, P. Potapov, S. Turubanova, A. Tyukavina, N. de Souza, L. Pintea, J.C. Brito, O.A. Llewellyn, A.G. Miller, A. Patzelt, S.A. Ghazanfar, J. Timberlake, H. Klöser, Y. Shennan-Farpon, R. Kindt, J.-P. Barnekow Lillesø, P. van Breugel, L. Graudal, M. Voge, K.F. Al-Shammari, and M. Saleem. 2017. An ecoregion-based approach to protecting half the terrestrial realm. BioScience 67:534-545.

Harrison, S., and R. Noss. 2017. Endemism hotspots are linked to stable climatic refugia. Annals of Botany 119:207-214.

Schumacher, E.L., W.A. Haney, E.L.H. Ragheb, L.H. Gibbs, R.F. Noss, P.D. Vickery, C.D. Anderson, and J. S. Reece. In press. No evidence of reduction in genetic diversity for the Florida Grasshopper Sparrow despite being on the verge of extinction after 100 years of population decline. Condor.

Klaus, J.M., and R.F. Noss. 2016. Specialist and generalist amphibians respond to wetland restoration treatments. Journal of Wildlife Management 6:1106-1119.

Grace, M.K., D.J. Smith, and R.F. Noss. 2015. Testing alternative designs for a roadside animal detection

system using a driving simulator. Nature Conservation 11:61-77.

Hanberry, B.B., R.F. Noss, S.K. Allison, D.C. Dey, and H.D. Safford. 2015. Restoration is preparation for the future. Journal of Forestry 113:425-429. doi: 10.5849/jof.15-014.

Pannozzo, P.L., P.F. Quintana-Ascencio, C.R. Hinkle, and R.F. Noss. 2015. Are state growth management programs viable tools for biodiversity conservation planning? A case study examining Florida local governments. Landscape and Urban Planning 139: 94–103.

Stambaugh, M.C., J.M. Varner, R.F. Noss, D.C. Dey, N.L. Christensen, R.F. Baldwin, R.P. Guyette, B.B. Hanberry, C.A. Harper, S.G. Lindblom, and T.A. Waldrop. 2015. Clarifying the role of fire in the deciduous forests of eastern North America: reply to Matlack. Conservation Biology 29:942-946.

Beudert, B., C. Bässler, R. Noss, B. Schröder, and J. Müller. 2015. Bark beetles increase biodiversity while maintaining drinking water quality. Conservation Letters. Published online December 2014: doi: 10.1111/conl.12153

Noss, R.F., W.J. Platt, B.A. Sorrie, A. S. Weakley, D.B. Means, J. Costanza, and R.K. Peet. 2015. How global biodiversity hotspots may go unrecognized: Lessons from the North American Coastal Plain. Diversity and Distributions 21:236-244. doi: 10.1111/ddi.12278.

Carroll, C., D.J. Rohlf, Y.-W. LI, B. Hartl, M.K. Phillips, and R.F. Noss. 2015. Connectivity conservation and endangered species recovery: a study in the challenge of defining conservation-reliant species. Conservation Letters 8:132-138. Published online April 2014. doi: 10.1111/conl.12102

Berger, J., S. Cain, E. Cheng, P. Dratch, K. Ellison, J. Francis, B. Frost, S. Gende, C. Groves, W.A. Karesh, E. Leslie, G. Machlis, R.A. Medellin, R.F. Noss, K.H. Redford, M. Soukup, D. Wilcove, and S. Zack. 2014. Optimism and challenge for science-based conservation of migratory species in and out of U.S. national parks. Conservation Biology 28:4-12.

Reece, J.S., and R.F. Noss. 2014. Prioritizing species by conservation value and vulnerability: a new index applied to species threatened by sea-level rise and other risks in Florida. Natural Areas Journal 34:31-45.

Reece, J.S., R.F. Noss, J. Oetting, T. Hoctor, and M. Volk. 2013. A vulnerability assessment of 300 species in Florida: threats from sea level rise, land use, and climate change. PLOS One 8(11): e80658. doi: 10.1371/journal.pone.0080658.

Reece, J.S., M. Bilskie, L. Ehrhart, S. Hagen, A. Hays, C. Long, R.F. Noss, D. Passeri, C. Sanchez, M.V. Schwoerer, B. Von Holle, J. Weishampel, and S. Wolf. 2013. Sea level rise, land use, and climate change influence the distribution of loggerhead turtle nests at the largest USA rookery (Melbourne Beach, Florida). Marine Ecology Progress Series 493: 259–274.

Korosy, M.G., J.S. Reece, and R.F. Noss. 2013. Winter habitat associations of four grassland sparrows in Florida dry prairie. Wilson Journal of Ornithology 125:502-512.

Benscoter, A.M., J.S. Reece, R.F. Noss, L.A. Brandt, F.J. Mazzotti, S.S. Romañach, and J.I. Watling. 2013.

Threatened and endangered subspecies with vulnerable ecological traits also have high susceptibility to sea level rise and habitat fragmentation. PLOS One 8 (8):10.1371/journal.pone.0070647.

Olson, D., D.A. DellaSala, R.F. Noss, J.R. Strittholt, J. Kass, M.E. Koopman, and T. Allnutt. 2012. Climate change refugia for biodiversity in the Klamath-Siskiyou ecoregion. Natural Areas Journal 32:65-74.

Noss, R.F., A. P. Dobson, R. Baldwin, P. Beier, C.R. Davis, D.A. DellaSala, J. Francis, H. Locke, K. Nowak, R.R. Lopez, C. Reining, S. Trombulak, and G. Tabor. 2012. Bolder thinking for conservation. Conservation Biology 26:1-4.

Noss, R.F. 2011. Between the devil and the deep blue sea: Florida's unenviable position with respect to sea level rise. Climatic Change 107:1-16.

Eisenberg, D., R.F. Noss, J. Waterman, and M.B. Main. 2011. Distribution and habitat use of the Big Cypress fox squirrel (*Sciurus niger avicennia*). Southeastern Naturalist 10:75-84.

Noss, R.F. 2010. Conservation science for land-use planning. Sustain: A Journal of Environmental and Sustainability Issues 22 (Spring/Summer 2010):54-59.

Lewandowski, A., R.F. Noss, and D. Parsons. 2010. Biodiversity surrogate taxa using hotspot and complementarity approaches. Conservation Biology 24:1367-1377.

Noss, R.F. 2010. Local priorities can be too parochial for biodiversity. Nature 463:424.

Müller, J., R.F. Noss, H. Bussler, and R. Brandl. 2010. Learning from a "benign neglect strategy" in a national park: Response of saproxylic beetles to dead wood accumulation. Biological Conservation 143:2559-2569.

Noss, R.F., E. Fleishman, D.A. DellaSala, J.M. Fitzgerald, M. Gross, M.B. Main, F. Nagle, S. O'Malley, and J. Rosales. 2009. Priorities for improving the scientific foundation of conservation policy in North America. Conservation Biology 23:825-833.

Noss, R.F. 2009. The heavy burden of conservation. Conservation Biology 23:1354-1355.

Lindenmayer, D., R.J. Hobbs, R. Montague-Drake, J. Alexandra, A. Bennett, M. Burgman, P. Cale, A. Calhoun, V. Cramer, P. Cullen, D. Driscoll, L. Fahrig, J. Fischer, J. Franklin, Y. Haila, M. Hunter, P. Gibbons, S. Lake, G. Luck, C. MacGregor, S. McIntyre, R. MacNally, A. Manning, J Miller, H. Mooney, R. Noss, H. Possingham, D. Saunders, F. Schmiegelow, M. Scott, D. Simberloff, T. Sisk, G. Tabor, B. Walker, J. Wiens, J. Woinarski, and E. Zavaleta. 2008. A checklist for ecological management of landscapes for conservation. Ecology Letters 11: 78-91

Prather, J., R.F. Noss, and T.D. Sisk. 2008. Real vs. perceived conflicts between restoration of ponderosa pine forests and conservation of the Mexican Spotted Owl. Forest Policy and Economics 10:140-150.

Noss, R.F. 2007. Values are a good thing in conservation biology. Conservation Biology 21:18-20.

Fazey, I., J. A. Fazey, J. Fischer, K. Sherren, J. Warren, R.F. Noss, and S.R. Dovers. 2007. Adaptive capacity and learning to learn as leverage for social-ecological resilience. Frontiers in Ecology and the Environment 5:375-380.

Noss, R.F., J.F. Franklin, W.L. Baker, T. Schoennagel, and P.B. Moyle. 2006. Managing fire-prone forests in the western United States. Frontiers in Ecology and the Environment 4:481-487.

Fleishman, E., R.F. Noss, and B.R. Noon. 2006. Utility and limitations of species richness metrics for conservation planning. Ecological Indicators 6:543-553.

Noss, R.F., P. Beier, W.W. Covington, R.E. Grumbine, D.B. Lindenmayer, J.W. Prather, F. Schmiegelow, T.D. Sisk, and D.J. Vosick. 2006. Recommendations for integrating restoration ecology and conservation biology in ponderosa pine forests of the southwestern United States. Restoration Ecology 14:4-10.

Meretsky, V.J., R.L. Fischman, J.R. Karr, D. Ashe, J.M. Scott, R.F. Noss, and R. Schroeder. 2006. New directions in conservation for the National Wildlife Refuge system. BioScience 56:135-143.

Meine, C., M. Soulé, and R.F. Noss. 2006. "A mission-driven discipline": the growth of conservation biology. Conservation Biology 20:631-651

Noss, R.F., and D.B. Lindenmayer. 2006. Introduction: The ecological effects of salvage logging after natural disturbance. Conservation Biology 20:946-948.

Lindenmayer, D.B., and R.F. Noss. 2006. Salvage logging, ecosystem processes, and biodiversity conservation. Conservation Biology 20:949-958.

DellaSala, D.A., J.R. Karr, T. Schoennagel, D. Perry, R.F. Noss, D. Lindenmayer, R. Beschta, R.L. Hutto, M.E. Swanson, and J. Evans. 2006. Post-fire logging debate ignores many issues. Science 314:51-52.

Svancara, L.K., R. Brannon, J.M. Scott, C.R. Groves, R.F. Noss, and R.L. Pressey. 2005. Policy-driven vs. evidence-based conservation: a review of political targets and biological needs. BioScience 55:989-995.

Czech, B., D. L. Trauger, J. Farley, R. Costanza, H. E. Daly, C. A. S. Hall, R. F. Noss, L. Krall, and P. R. Krausman. 2005. Establishing indicators for biodiversity. Science 308:791-792.

Lindenmayer, D.B., D.R. Foster, J.F. Franklin, M.L. Hunter, R.F. Noss, F.A. Schmiegelow, and D. Perry. 2004. Saving forests or saving fiber? Salvage harvesting policies after natural disturbance impairs ecosystem and species recovery. Science 303:1303.

Carroll, C., R.F. Noss, P.C. Paquet, and N.H. Schumaker. 2004. Extinction debt of protected areas in developing landscapes. Conservation Biology 18:1110-1120.

Noss, R.F. 2004. Conservation targets and Information needs for regional conservation planning. Natural Areas Journal 24:223-231.

Noss, R.F. 2004. Some suggestions for keeping National Wildlife Refuges healthy and whole. Natural Resources Journal 44:1093-1111.

Redford, K.H. P. Coppolillo, E.W. Sanderson, G.A.B. da Fonseca, E. Dinerstein, C. Groves, G. Mace, S. Maginnis, R. Mittermeier, R. Noss, D. Olson, J.G. Robinson, A. Vedder, and M. Wright. 2003. Mapping the conservation landscape. Conservation Biology 17:116-131.

Noss, R.F. 2003. A checklist for wildlands network designs. Conservation Biology 17:1270-1275.

Carroll, C., R.F. Noss, P.C. Paquet, and N.H. Schumaker. 2003. Use of population viability analysis and reserve selection algorithms in regional conservation plans. Ecological Applications 13:1773-1789.

Noss, R.F., C. Carroll, K. Vance-Borland, and G. Wuerthner. 2002. A multicriteria assessment of the irreplaceability and vulnerability of sites in the Greater Yellowstone Ecosystem. Conservation Biology 16:895-908.

Noss, R.F. 2001. Beyond Kyoto: Forest management in a time of rapid climate change. Conservation Biology 15:578-590.

Noss, R.F., and R. Kranz. 2001. Ecological issues in conservation: introduction. Ecological Applications 11:945-946.

Carroll, C., R.F. Noss, and P.C. Paquet. 2001. Carnivores as focal species for conservation planning in the Rocky Mountain region. Ecological Applications 11:961-980.

Andreasen, J.K., R.V. O'Neill, R. Noss, and N.C. Slosser. 2001. Considerations for the development of a terrestrial index of ecological integrity. Ecological Indicators 1:21-35.

Brown, N.R., R.F. Noss, D.D. Diamond, and M.N. Myers. 2001. Conservation biology and forest certification: working together toward ecological sustainability. Journal of Forestry 99(8):18-25.

DellaSala, D.A., R.F. Noss, and D. Perry. 2000. Applying conservation biology and ecosystem management to federal lands and forest certification. Ecoforestry 15(2):28-39.

Noss, R.F. 2000. High-risk ecosystems as foci for considering biodiversity and ecological integrity in ecological risk assessments. Environmental Science and Policy 3:321-332.

Noss, R.F., and P.B. Beier. 2000. Arguing over little things: A reply to Haddad et al. Conservation Biology 14: 1546-1548.

Noss, R.F. 1999. Assessing and monitoring forest biodiversity: a suggested framework and indicators. Forest Ecology and Management 115:135-146.

Noss, R.F. 1999. Is there a special conservation biology? Ecography 22:113-122.

Noss, R.F. 1999. Aldo Leopold was a conservation biologist. Wildlife Society Bulletin 26:713-718.

Noss, R.F., J. R. Strittholt, K. Vance-Borland, C. Carroll, and P. Frost. 1999. A conservation plan for the Klamath-Siskiyou ecoregion. Natural Areas Journal 19:392-411.

Carroll, C., W. J. Zielinski, and R.F. Noss. 1999. Using presence-absence data to build and test spatial habitat models for the fisher in the Klamath region, USA. Conservation Biology 13:1344-1359.

Main, M.B., F.M. Roka, and R.F. Noss. 1999. Evaluating costs of conservation. Conservation Biology 13:1262-1272.

Beier, P., and R.F. Noss. 1998. Do habitat corridors provide connectivity? Conservation Biology 12:1241-1252.

Noss, R.F. 1996. Biodiversity, ecological integrity, and wilderness. International Journal of Wilderness 2(2):5-8.

Christensen, N.L., A.M. Bartuska, J.H. Brown, S. Carpenter, C. D'Antonio, R. Francis, J.F. Franklin, J.A. MacMahon, R.F. Noss, D.J. Parsons, C.H. Peterson, M.G. Turner, and R.G. Woodmansee. 1996. The report of the Ecological Society of America Committee on the Scientific Basis for Ecosystem Management. Ecological Applications 6:665-691.

Noss, R.F., H.B. Quigley, M.G. Hornocker, T. Merrill, and P. Paquet. 1996. Conservation biology and carnivore conservation. Conservation Biology 10:949-963.

Noss, R.F. 1996. Ecosystems as conservation targets. Trends in Ecology and Evolution 11:351.

DellaSala, D., J.R. Strittholt, R.F. Noss, and D.M. Olson. 1996. A critical role for core reserves in managing Inland Northwest landscapes for natural resources and biodiversity. Wildlife Society Bulletin 24:209-221.

Kiester, A.R., J.M. Scott, B. Csuti, R. Noss, B. Butterfield, K. Sahr, and D. White. 1996. Conservation prioritization using GAP data. Conservation Biology 10:1332-1342.

Noss, R.F. 1996. On attacking a caricature of reserves: response to Everett and Lehmkuhl. Wildlife Society Bulletin 24:777-779.

Noss, R.F. 1995. Assessing rigor and objectivity in conservation science. Wildlife Society Bulletin 23:539-541.

Atwood, J.L., and R.F. Noss. 1994. Gnatcatchers and natural community conservation planning: Have we really avoided a train wreck? Illahee: Journal of the Northwest Environment 10:123-130.

Noss, R.F. 1994. Some principles of conservation biology, as they apply to environmental law. Chicago Kent Law Review 69:893-909.

Scott, J.M., F. Davis, B. Csuti, R. Noss, B. Butterfield, C. Groves, H. Anderson, S. Caicco, F. D'Erchia, T.C. Edwards, J. Ulliman, and R.G. Wright. 1993. Gap Analysis: A geographic approach to protection of biological diversity. Wildlife Monographs 123:1-41.

Noss, R.F. 1993. A conservation plan for the Oregon Coast Range: Some preliminary suggestions. Natural Areas Journal 13:276-290.

Kremen, C., R. Colwell, T.L. Erwin, D.D. Murphy, R.F. Noss, and M.A. Sanjayan. 1993. Terrestrial arthropod assemblages: Their use in conservation planning. Conservation Biology 7: 796-808.

Hughes, R.M., and R.F. Noss. 1992. Biological diversity and biological integrity: Current concerns in lakes and streams. Fisheries 17(3):11-19.

O'Connell, M.A., and R.F. Noss. 1992. Private land management for biodiversity conservation. Environmental Management 16:435-450.

Frissell, C.A., R.K. Nawa, and R. Noss. 1992. Is there any conservation biology in "New Perspectives?": A reply to Salwasser. Conservation Biology 6:461-464.

Noss, R.F. 1991. Effects of edge and internal patchiness on avian habitat use in an old-growth Florida hammock. Natural Areas Journal 11:34-47.

Hirth, D.H., L.D. Harris, and R.F. Noss. 1991. Avian community dynamics in a peninsular Florida longleaf pine forest. Florida Field Naturalist 19(2):33-48.

Noss, R.F. 1991. Wilderness recovery: Thinking big in restoration ecology. The Environmental Professional 13:225-234.

Noss, R.F. 1990. Can we maintain biological and ecological integrity? Conservation Biology 4: 241-243.

Noss, R.F. 1990. Indicators for monitoring biodiversity: A hierarchical approach. Conservation Biology 4:355-364.

Noss, R.F. 1989. Longleaf pine and wiregrass: Keystone components of an endangered ecosystem. The Natural Areas Journal 9:211-213.

Noss, R.F. 1987. From plant communities to landscapes in conservation inventories: a look at The Nature Conservancy (USA). Biological Conservation 41:11-37.

Noss, R.F. 1987. Corridors in real landscapes: a reply to Simberloff and Cox. Conservation Biology 1:159-164.

Noss, R.F. 1987. Protecting natural areas in fragmented landscapes. The Natural Areas Journal 7 (1):2-13.

Noss, R.F. 1986. Dangerous simplifications in conservation biology. Bulletin of the Ecological Society of America 67:278-279.

Noss, R.F., and L.D. Harris. 1986. Nodes, networks, and MUM's: preserving diversity at all scales. Environmental Management 10:299-309.

Noss, R.F. 1985. On characterizing presettlement vegetation: how and why. The Natural Areas Journal 5(1):5-19.

Noss, R.F., and S. McKee. 1983. The breeding birds of Mohican. The Ohio Cardinal 4(2):37-40.

Noss, R.F. 1983. Different levels of natural areas thinking. The Natural Areas Journal 3(3): 8-14.

Noss, R.F. 1983. A regional landscape approach to maintain diversity. BioScience 33:700-706.

Noss, R.F. 1981. The birds of Sugarcreek, an Ohio nature reserve. Ohio Journal of Science 81:29-40.

***Book Chapters***

Noss, R.F. In press. The spectrum of wildness and rewilding: justice for all. In H. Kopnina and H. Washington, editors. Conservation – Integrating Social and Ecological Justice.

Boughton, E.H., P.J. Bolen, S.L. Orzell, E.L. Bridges, and R.F. Noss. 2018. Conservation and management of subtropical grassland in south-central Florida. Pages 209-221 in J. Hill and J. Barone, editors. Grasslands of the Southeastern United States. University of Alabama Press, Tuscaloosa.

Noss, R.F., A. P. Dobson, R. Baldwin, P. Beier, C.R. Davis, D.A. DellaSala, J. Francis, H. Locke, K. Nowak, R.R. Lopez, C. Reining, S. Trombulak, and G. Tabor. 2015. Bolder thinking for conservation. Pages 16-20 in G. Wuerthner, E. Crist, and T. Butler, editors. Protecting the Wild: Parks and Wilderness, the Foundation for Conservation. Island Press, Washington, D.C.

Noss, R.F. 2014. The complementary values of wilderness and biodiversity. Pages 22-27 in E. Molvar and J. Nesset, editors. Fifty Years of American Wilderness. Fairmont Media Group, Tampa, FL.

DellaSala, D.A., F. Moola, P. Alaback, P.C. Paquet, J.W. Schoen, and R.F. Noss. 2011. Temperate and boreal rainforests of the Pacific Coast of North America. Pages 42-81 in D.A. DellaSala, editor. Temperate and Boreal Rainforests of the World: Ecology and Conservation. Island Press, Washington, D.C.

DellaSala, D.A., P. Alaback, L. Craighead, F. Goward, H. Hakon, J. Kirkpatrick, P. Krestov, F. Moola, R. Nauman, Y. Nakamura, R.F. Noss, P. Paquet, K. Ronneberg, T. Spribille, D. Tecklin, and H. von Wehrden. 2011. Crosscutting issues and conservation strategies. Pages 243-259 in D.A. DellaSala, editor. Temperate and Boreal Rainforests of the World: Ecology and Conservation. Island Press, Washington, D.C.

Noss, R.F., S. Nielsen, and K. Vance-Borland. 2009. Prioritizing ecosystems, species, and sites for restoration. Pages 158-171 in A. Moilanen, H. Possingham, and K. Wilson, editors. Spatial Conservation Prioritisation: Quantitative Methods and Computational Tools. Oxford University Press, Oxford, U.K.

Noss, R.F. 2007. Conservation thresholds: overview and commentary. Pages 1-12 in Kihslinger, R.L., and J. Wilkinson, editors. Lasting Landscapes: Reflections on the Role of Conservation Science in Land Use Planning. Environmental Law Institute, Washington D.C.

Noss, R.F. 2007. Focal species for determining connectivity requirements in conservation planning. Pages 263-279 in D.B. Lindenmayer and R.J. Hobbs, editors. Managing and Designing Landscapes for Conservation: Moving from Perspectives to Principles. Blackwell, London.

Noss, R.F., B. Csuti, and M.J. Groom. 2006. Habitat fragmentation. Pages 213-251 in M.J. Groom, G.K. Meffe, and R.C. Carroll, eds. Principles of Conservation Biology. Third edition. Sinauer Associates, Sunderland, MA.

Hoctor, T.S., R.F. Noss, L.D. Harris, and K.A. Whitney. 2006. Spatial ecology and restoration of the longleaf pine evosystem. Pages 377-402 in S. Jose, E. Jokela, and D. Miller, editors. The Longleaf Pine Ecosystem: Ecology, Silviculture, and Restoration. Springer-Verlag, New York.

Noss, R.F. 2006. Greenways as wildlife corridors. Pages 70-107 in P.C. Hellmund and D.S. Smith, editors. Designing Greenways: Sustainable Landscapes for Nature and People. Island Press, Washington, D.C.

Noss, R.F. 2006. Introduction to the Florida "Dry" Prairie. Pages 1-2 in R.F. Noss, editor. Land of Fire and Water: The Florida Dry Prairie Ecosystem. Proceedings of the Florida Dry Prairie Conference. E.O. Painter, De Leon Springs, FL.

Noss, R.F., and K. Daly. 2006. Incorporating connectivity into broad-scale conservation planning. Pages 587-619 in K. Crooks and M. Sanjayan, editors. Connectivity Conservation: Maintaining Connections for Nature. Cambridge University Press, Cambridge, U.K.

Noss, R.F. 2002. Aldo Leopold was a conservation biologist. Pages 106-117 in R.L, Knight and S. Riedel, eds. Aldo Leopold and the Ecological Conscience. Oxford University Press, Oxford, UK.

Noss, R.F. 2001. Introduction: Why restore large mammals? Pages 1-21 in D. Maehr, R. Noss, and J. Larkin, eds. Large Mammal Restoration: Ecological and Sociological Challenges for the 21st Century. Island Press, Washington, DC.

Carroll, C., R. F. Noss, N. H. Schumaker, and P. C. Paquet. 2001. Is the return of the wolf, wolverine, and grizzly bear to Oregon and California biologically feasible? Pages 25-46 in D. Maehr, R. Noss, and J. Larkin, eds. Large Mammal Restoration: Ecological and Sociological Challenges for the 21st Century. Island Press, Washington, DC.

Noss, R. 2000. More than big trees. Pages 1-6 in R. Noss, ed. The Redwood Forest: History, Ecology, and Conservation of the Coast Redwoods. Island Press, Washington, DC.

Sawyer, J.O., J. Gray, G.J. West, D. Thornburgh, R.F. Noss, J.J. Engbeck, B. Marcot, and R. Raymond. 2000. History of redwood and redwood forests. Pages 7-38 in R. Noss, ed. The Redwood Forest: History, Ecology, and Conservation of the Coast Redwoods. Island Press, Washington, DC.

Sawyer, J.O., S.C. Sillett, J.H. Popenoe, A. LaBanca, T. Sholars, D. Largent, F. Euphrat, R. Noss, and R. Van Pelt. 2000. Characteristics of redwood forests. Pages 39-79 in R. Noss, ed. The Redwood Forest: History, Ecology, and Conservation of the Coast Redwoods. Island Press, Washington, DC.

Sawyer, J.O., S.C. Sillett, W.J. Libby, T.E. Dawson, J.H. Popenoe, D.L. Largent, R. Van Pelt, S.D. Viers, Jr., R.F. Noss, D.A. Thornburgh, and P. del Tredici. 2000. Redwood trees, communities, and ecosystems: a closer look. Pages 81-118 in R. Noss, ed. The Redwood Forest: History, Ecology, and Conservation of the Coast Redwoods. Island Press, Washington, DC.

Cooperrider, A., R. Noss, H. Welsh, C. Carroll, W. Zielinski, D. Olson, K. Nelson, and B. Marcot. 2000. Terrestrial fauna of redwood forests. Pages 119-163 in R. Noss, ed. The Redwood Forest: History, Ecology, and Conservation of the Coast Redwoods. Island Press, Washington, DC.

Noss, R., J. Strittholt, G. Heilman,, P. Frost, and M. Sorensen. 2000. Conservation planning in the redwoods region. Pages 201-228 in R. Noss, ed. The Redwood Forest: History, Ecology, and Conservation of the Coast Redwoods. Island Press, Washington, DC.

Thornburgh, D., R. Noss, F. Euphrat, D. Angelides, C. Olson, A. Cooperrider, H. Welsh, and T. Roelofs. 2000. Managing redwoods. Pages 229-261 in R. Noss, ed. The Redwood Forest: History, Ecology, and Conservation of the Coast Redwoods. Island Press, Washington, DC.

Noss, R. 2000. Lessons from the redwoods. Pages 263-268 in R. Noss, ed. The Redwood Forest: History, Ecology, and Conservation of the Coast Redwoods. Island Press, Washington, DC.

Noss, R.F. 2000. Maintaining the ecological integrity of landscapes and ecoregions. Pages 191-208 in D. Pimentel, L. Westra, and R. Noss, editors. Ecological Integrity: Integrating Environment, Conservation, and Health. Island Press, Washington, DC.

Terborgh, J., J.A. Estes, P. Paquet, K. Ralls, D. Boyd-Heger, B.J. Miller, and R.F. Noss. 1999. The role of top carnivores in regulating terrestrial ecosystems. Pages 39-64 in M.E. Soulé and J. Terborgh (eds.). Continental Conservation: Scientific Foundations of Regional Reserve Networks. Island Press, Washington, DC.

Noss, R.F., E. Dinerstein, B. Gilbert, M. Gilpin, B. Miller, J. Terborgh, and S. Trombulak. 1999. Core areas: Where nature reigns. Pages 99-128 in M.E. Soulé and J. Terborgh (eds.). Continental Conservation: Scientific Foundations of Regional Reserve Networks. Island Press, Washington, DC.

Dobson, A., K. Ralls, M. Foster, M.E. Soulé, D. Simberloff, D. Doak, J.A. Estes, L.S. Mills, D. Mattson, R. Dirzo, H. Arita, S. Ryan, E.A. Norse, R.F. Noss, and D. Johns. 1999. Corridors: Reconnecting fragmented landscapes. Pages 129-170 in M.E. Soulé and J. Terborgh (eds.). Continental Conservation: Scientific Foundations of Regional Reserve Networks. Island Press, Washington, DC.

Noss, R.F. 1999. At what scale should we manage biodiversity? Pages 96-116 in F. Bunnell and J. Jackson, eds. The Living Dance: Policy and Practices for Biodiversity in Forest Landscapes. University of British Columbia Press, Vancouver, BC.

Noss, R. 1999. Conservation assessments: a synthesis. Pages 89-92 in T.H. Ricketts, E. Dinerstein, D.M. Olson, C.J. Loucks, W. Eichbaum, D. DellaSala, K. Kavanagh, P. Hedao, P.T. Hurley, K.M. Carney, R. Abell, and S. Walters, editors. Terrestrial Ecoregions of North America: A Conservation Assessment. Island Press, Washington, DC.

Weakley, A.S., E. Dinerstein, R. Noss, and K. Wolfe. 1999. Southeastern mixed forests. Pages 197-199 in T.H. Ricketts, E. Dinerstein, D.M. Olson, C.J. Loucks, W. Eichbaum, D. DellaSala, K. Kavanagh, P. Hedao, P.T. Hurley, K.M. Carney, R. Abell, and S. Walters, editors. Terrestrial Ecoregions of North America: A Conservation Assessment. Island Press. Washington, DC.

Weakley, A.S., E. Dinerstein, R. Noss, S. Robinson, J. Strittholt, and J. Adams. 1999. Ozark Mountain forests. Pages 192-193 in T.H. Ricketts, E. Dinerstein, D.M. Olson, C.J. Loucks, W. Eichbaum, D. DellaSala, K. Kavanagh, P. Hedao, P.T. Hurley, K.M. Carney, R. Abell, and S. Walters, editors. Terrestrial Ecoregions of North America: A Conservation Assessment. Island Press. Washington, DC.

Weakley, A.S., R. Noss, E. Dinerstein, S. Robinson, and J. Adams. 1999. Central U.S. mixed hardwood forests. Pages 190-192 in T.H. Ricketts, E. Dinerstein, D.M. Olson, C.J. Loucks, W. Eichbaum, D. DellaSala, K. Kavanagh, P. Hedao, P.T. Hurley, K.M. Carney, R. Abell, and S. Walters, editors. Terrestrial Ecoregions of North America: A Conservation Assessment. Island Press. Washington, DC.

Loucks, C., D. Olson, E. Dinerstein, A.S. Weakley, R. Noss, J. Strittholt, and K. Wolfe. 1999. Appalachian mixed mesophytic forests. Pages 186-190 in T.H. Ricketts, E. Dinerstein, D.M. Olson, C.J. Loucks, W. Eichbaum, D. DellaSala, K. Kavanagh, P. Hedao, P.T. Hurley, K.M. Carney, R. Abell, and S. Walters, editors. Terrestrial Ecoregions of North America: A Conservation Assessment. Island Press. Washington, DC.

Loucks, C., D. Olson, E. Dinerstein, A.S. Weakley, R. Noss, J. Strittholt, and K. Wolfe. 1999. Appalachian/Blue Ridge forests. Pages 182-186 in T.H. Ricketts, E. Dinerstein, D.M. Olson, C.J. Loucks, W. Eichbaum, D. DellaSala, K. Kavanagh, P. Hedao, P.T. Hurley, K.M. Carney, R. Abell, and S. Walters, editors. Terrestrial Ecoregions of North America: A Conservation Assessment. Island Press. Washington, DC.

Noss, R.F. 1999. Restoring grassland ecosystems: an opportunity to save the pieces. Pages 36-37 in B.L. Harper-Lore, ed. Roadside Use of Native Plants. U.S. Department of Transportation, Federal Highway Administration. Washington, DC.

Noss, R.F., and J.M. Scott. 1997. Ecosystem protection and restoration: The core of ecosystem management. Pages 239-264 in M.A. Boyce and A.W. Haney, eds. Ecosystem Management: Concepts and Methods. Yale University Press, New Haven, CT.

Noss, R.F., and B. Csuti. 1997. Habitat fragmentation. Pages 269-304 in G.K. Meffe and R.C. Carroll, eds. Principles of Conservation Biology. Second edition. Sinauer Associates, Sunderland, MA.

Noss, R.F. 1997. Conservation assessments: a synthesis. Pages 95-99 in T. Ricketts, E. Dinerstein, D.M. Olson, C. Loucks, P. Hedao, P. Hurley, R. Abell, S. Walters, and K. Carney. A Conservation Assessment of the Terrestrial Ecoregions of North America. World Wildlife Fund, Washington, DC.

Noss, R.F. 1997. Principles of conservation biology. Pages 16-30 in L. Jenkins and J. Peepre, eds. Towards a Yukon Protected Areas Strategy: Applying thr Principles of Conservation Biology. Proceedings of a Workshop on Conservation Biology, Whitehorse, Yukon, May, 1996. Canadian Parks and Wilderness Society, Whitehorse, Yukon.

Noss, R.F. 1996. Conservation of biodiversity at the landscape scale. Pages 574-589 in R.C. Szaro and D.W. Johnston, eds. Biodiversity in Managed Landscapes. Oxford University Press, New York.

Noss, R.F. 1996. Protected areas: How much is enough? Pages 91-120 in R.G. Wright, ed. National Parks and Protected Areas: Their Role in Environmental Protection. Blackwell, Cambridge, MA.

Noss, R.F. 1995. Ecological integrity and sustainability: buzzwords in conflict? Pages 60-76 in L. Westra and J. Lemons, eds. Perspectives on Ecological Integrity. Springer Netherlands.

Noss, R.F., and B. Csuti. 1994. Habitat fragmentation. Pages 237-264 in G.K. Meffe and R.C. Carroll, eds. Principles of Conservation Biology. Sinauer Associates, Sunderland, MA.

Noss, R.F. 1994. Creating regional reserve networks. Pages 289-290 in G.K. Meffe and R.C. Carroll, eds. Principles of Conservation Biology. Sinauer Associates, Sunderland, MA.

Noss, R.F. 1994. Hierarchical indicators for monitoring changes in biodiversity. Pages 79-80 in G.K. Meffe and R.C. Carroll, eds. Principles of Conservation Biology. Sinauer Associates, Sunderland, MA.

Noss, R.F. 1994. Biodiversity, wildness, and The Wildlands Project. Pages 34-42 in D.C. Burks, ed. Place of the Wild: A Wildlands Anthology. Island Press, Washington, DC.

Noss, R.F. 1993. Wildlife corridors. Pages 43-68 in D.S. Smith and P.C. Hellmund, eds. Ecology of Greenways. University of Minnesota Press, Minneapolis, MN.

Henderson, S., R.F. Noss, and P. Ross. 1993. Can NEPA protect biodiversity? Pages 463-472 in S.G. Hildebrand and J.B. Cannon, eds. Environmental Analysis: The NEPA Experience. Lewis, Boca Raton, FL.

Grumbine, R.E., M. Friedman, and R.F. Noss. 1993. Conserving biodiversity in the Greater North Cascades Ecosystem. Pages 136-155 in M. Friedman and P. Lindholdt, eds. Cascadia Wild. Greater Ecosystem Alliance and Frontier Publishing, Seaside, OR.

Noss, R.F. 1993. A sustainable forest is a diverse and natural forest. Pages 33-39 in B. Devall, ed. Clearcut: The Tragedy of Industrial Forestry. Sierra Club Books and Earth Island Press, San Francisco, CA.

Noss, R.F. 1992. Issues of scale in conservation biology. Pages 239-250 in P.L. Fiedler and S.K. Jain, eds. Conservation Biology: The Theory and Practice of Nature Conservation, Preservation, and Management. Chapman and Hall, New York.

Noss, R.F., S.P. Cline, B. Csuti, and J.M. Scott. 1992. Monitoring and assessing biodiversity. Pages 67-85 in E. Lykke, ed. Achieving Environmental Goals: The Concept and Practice of Environmental Performance Review. Belhaven Press, London, England.

Noss, R.F. 1992. Interpreting biodiversity. Pages 11-37 in W.E. Hudson, ed. Nature Watch: A Resource for Enhancing Wildlife Viewing Areas. Defenders of Wildlife and Falcon Press, Helena, MT.

Noss, R.F. 1991. From endangered species to biodiversity. Pages 227-246 in K. Kohm, editor. Balancing on the Brink of Extinction: The Endangered Species Act and Lessons for the Future. Island Press, Washington, DC.

Noss, R.F. 1991. Landscape connectivity: Different functions at different scales. Pages 27-39 in W.E. Hudson, ed. Landscape Linkages and Biodiversity. Island Press, Washington, DC.

Barker, J.R., S.H. Henderson, R.F. Noss. and and D.T. Tingey. 1991. Biodiversity and human impacts. Pages 353-362 in Encyclopedia of Earth System Science, Vol. 1. Academic Press, San Diego, CA.

Duever, L.C., and R.F. Noss. 1990. A computerized method of priority ranking for natural areas. Pages 22-33 in R.S. Mitchell, C.J. Sheviak, and D.J. Leopold, eds. Ecosystem Management: Rare Species and Significant Habitats. Bulletin No. 471, New York State Museum, Albany, NY.

Noss, R.F. 1990. What can wilderness do for biodiversity? Pages 49-61 in P. Reed, ed. Preparing to Manage Wilderness in the 21st Century. USDA Forest Service, Southeastern Forest Experiment Station, Asheville, NC.

Noss, R.F., and M.J. Bland. 1990. Geology and physiography. Pages 4-26 in S.H. Wolfe, ed. An Ecological Characterization of the Florida Springs Coast: Pithlachascotee to Waccasassa Rivers. Biological Report 90(21). USDI Fish and Wildlife Service, Washington, DC.

Noss, R.F., and S.H. Wolfe. 1990. Summary. Pages 211-219 in S.H. Wolfe, ed. An Ecological Characterization of the Florida Springs Coast: Pithlachascotee to Waccasassa Rivers. Biological Report 90(21). USDI Fish and Wildlife Service, Washington, DC.

Henderson, S., R.K. Olson, and R.F. Noss. 1989. Current and potential threats to biodiversity in forests of the Lower Pacific Coastal States. Pages 325-336 in R.K. Olson and A.S. Lefohn, eds. Effects of Air Pollution on Western Forests. Air and Waste Management Association, Pittsburgh, PA.

***Technical and Other Reports***

Noss, R.F. 2018. Connectivity Considerations in Public Lands Conservation Strategy. A Report to the Pew Charitable Trusts. Florida Institute for Conservation Science, Chuluota, FL.

Noss, R.F., J.S. Reece, T. Hoctor, M. Volk, and J. Oetting. 2014. Adaptation to Sea-level Rise in Florida: Biological Conservation Priorities. Final Report to The Kresge Foundation Grant Request Number 244146. University of Central Florida, Orlando, FL.

Hoctor, T., M. Volk, R. Noss, J. Reece, and J. Oetting. 2014. Predicting and Mitigating the Effects of Sea Level Rise and Land Use Changes on Imperiled Species and Natural Communities in Florida. FWC Agreement: 10289. Final Report to the Florida Fish and Wildlife Conservation Commission. University of Florida, Gainesville, FL.

Pannozzo, P.L., and R.F. Noss. 2013. Florida counties conservation planning survey. Report. University of Central Florida, Orlando, FL.

Cameron Devitt, S.E., J. R. Seavey, S. Claytor, T. Hoctor, M. Main, O. Mbuya, R. Noss, C. Rainyn. 2012. Florida Biodiversity Under a Changing Climate, Florida Climate Task Force. http://www.floridaclimate.org/whitepapers

Noss, R.F. 2011. Integrated Adaptive Management Framework for the North Irvine Ranch Wildlands. OC Parks, County of Orange, Irvine, CA.

Smith, D.J. and R.F. Noss. 2011. A Reconnaissance Study of Actual and Potential Wildlife Crossing Structures in Central Florida, Final Report. UCF-FDOT Contract No. BDB-10. University of Central Florida, Orlando, FL.

DellaSala, D.A., D. Olson, J.R. Strittholt, R.F. Noss, J. Kass, M.E. Koopman, and T. Allnutt. 2010. Klamath-Siskiyou Ecoregion: Conservation Action for Climate Change. Geos Institute, Ashland, OR.

Noss, R.F., and W.W. Covington. 2010. Comparative Ecology and Management of Pine Savannas and Woodlands. Ecological Restoration Institute, Flagstaff, AZ.

Hoctor, T.S. and R.F. Noss. 2010. Babcock Ranch Regional Connectivity Study. Report to Babcock Ranch Wildlife Corridor Steering Committee and Lands Surrounding Babcock Ranch Steering Committee. Kitson Babcock L.L.C., Port Charlotte, FL.

Spencer, W., S. Abella, C. Barrows, K. Berry, T. Esque, K. Garrett, C.A. Howell, R. Kobaly, R. Noss, R. Redak, R. Webb, and T. Weller. 2010. Recommendations of Independent Science Advisors for the California Desert Renewable Energy Conservation Plan (DRECP). Renewable Energy Action Team (California Department of Fish & Game, U.S. Fish & Wildlife Service, U.S. Bureau of Land Management, California Energy Commission), Sacramento, CA.

Carroll, C., D.C. Odion, C.A. Frissell, D.A. Dellasala, B.R. Noon, and R. Noss. 2009. Coarse-Scale Versus Fine-Scale Management of Forest Ecosystems: Are Reserves Still Relevant? Report to the Wilburforce Foundation. Klamath Center for Conservation Research, Orleans, CA.

Adaptation for Climate Sensitive Ecosystems and Resources Advisory Committee (ACSERAC) (P. Risser and Reed Noss, co-chairs and editors). 2008. Summary Comments on "Synthesis and Assessment Product 4.4: Preliminary Review of Adaptation Options for Climate-Sensitive Ecosystems and Resources." U.S. Climate Change Science Program, U.S. Environmental Protection Agency, Washington, D.C.

Noss, R.F., M. Korosy, D. Breininger, J. Aldredge, and R. Bjork. 2008. An Investigation of Breeding and Non-breeding season ecology, metapopulation dynamics, and recovery options for the Florida Grasshopper Sparrow (*Ammodramus savannarum floridanus*). Final Report to the U.S. Fish and Wildlife Service, Agreement No. 401815G034. University of Central Florida, Orlando, FL.

Scientific Advisory Committee (D. Gauthier, R. Noss, P. Diaz, P. James, B. Noble, and B. Cecil). 2007. Great Sand Hills Regional Environmental Study. University of Regina, Regina, SK.

Carroll, C., L. Craighead, R.F. Noss, and J. Vucetich. 2006. Comments of the North American Section of the Society for Conservation Biology on Proposed Rule to Delist the Yellowstone Grizzly Bear Population (70 Fed. Reg. 69854-69884). Society for Conservation Biology, Washington, D.C.

Spencer, W., R. Noss, J. Marty, M. Schwartz, S. Gregory, R. Hansen, and G. Wylie. 2006. Report of the Independent Science Advisors for the Yuba and Sutter County Natural Community Conservation Plan/Habitat Conservation Plan (NCCP/HCP). County of Sutter, Yuba City, CA.

Spencer, W., R. Noss, J. Marty, M. Schwartz, E. Soderstrom, P. Bloom, and G. Wylie. 2006. Report of Independent Science Advisors for the Yolo County Natural Community Conservation Plan/Habitat Conservation Plan (NCCP/HCP). Yolo County Joint Powers Agency, West Sacramento, CA.

Noss, R.F., P. Beier, R. Fisher, B. Foster, J.D. Opdycke, E. Rubin, D. Stokes, and K.S. Williams. 2006. Report of the Independent Science Advisors on the San Diego East County MSCP (NCCP/HCP). Part I: Recommendations Following the Workshop, February 2-3, 2006. San Diego, CA.

Noss, R., and P. Friederici. 2006. Integrating ecological restoration and conservation biology. Ecological Restoration Institute, Flagstaff, Arizona.

Schmiegelow, F.K.A., S. G. Cumming, S. Harrison, S. Leroux, K. Lisgo, R. Noss, and B. Olsen. 2006. Conservation beyond crisis management: a reverse-matrix model. BEACONs Discussion Paper No. 1. Available online at www.rr.ualberta.ca/research/beacons/publications.htm.

Noss, R.F., J.F. Franklin, W.L. Baker, T. Schoennagel, and P.B. Moyle. 2006. Ecology and management of fire-prone forests of the western United States. Society for Conservation Biology Scientific Panel on Fire in Western U.S. Forests. Society for Conservation Biology, North American Section. Arlington, VA. Available online at www.conbio.org/sections/namerica/napolicy.cfm

Rumsey, C., J. Ardron, K. Ciruna, T. Curtis, Z. Ferdana, T. Hamilton, K. Heinemeyer, P. Iachetti, R. Jeo, G. Kaiser, D. Narver, R. Noss, D. Sizemore, A. Tautz, R. Tingey, and K. Vance-Borland. 2004. An Ecosystem Spatial Analysis for Haida Gwai, Central Coast, and North Coast British Columbia. Coast Information Team, Victoria, B.C.

Noss, R.F., P. Beier, W. W. Covington, R. E. Grumbine, D.B. Lindenmayer, J.W. Prather, F. Schmiegelow, T.D. Sisk, D.J. Vosick. 2004. Integrating Ecological Restoration and Conservation Planning: A Case Study for Ponderosa Pine Ecosystems of the Southwest. Northern Arizona University, Flagstaff, AZ.

Foreman, D., K. Daly, R.F. Noss, M. Clark, K. Menke, D. R. Parsons. R. Howard. 2003. New Mexico Highlands Wildlands Network Vision—Connecting the sky islands to the Southern Rockies. Wildlands Project, Richmond, VT.

Noss, R.F., L. Benda, T. Hamer, J. McBride, T. Roelofs, T. Sholars, and R. Ziemer. 2003. Report of Science Advisors, Mendocino Redwood Company Natural Community Conservation Plan and Habitat Conservation Plan. Ukiah, CA.

Noss, R., P. Beier, D. Faulkner, R. Fisher, B. Foster, T. Griggs, P. Kelly, J. Opdycke, T. Smith, and P. Stine. 2002. Independent science advisors' review: North County Subarea Plan, County of San Diego, Multiple Species Conservation Program. Part II: Review of Consultants' Response to Part I Report and Revision of Preserve Planning Process. San Diego, CA.

Noss, R.F., K. Bennett, E. Butterworth, A. Couturier, P. Paquet, and K. Vance-Borland. 2002. Conservation Biology for Canada's Boreal Forest. Report to the Pew Foundation and the Canadian Boreal Trust. Conservation Science, Inc. Corvallis, OR.

Carroll, C., R.F. Noss, and P.C. Paquet. 2002. Rocky Mountain Carnivore Project Final Report. Report to World Wildlife Fund Canada. Conservation Science, Inc. Corvallis, OR.

Noss, R., R. Amundson, M. Barbour, R. Bugg, B. Cypher, R. Grosberg, T. Hanes, R. Hansen, B. Pavlik, K. Rice, P. Trenham, B. Shaffer, and B. Weir. 2002. Report of Science Advisors, Eastern Merced County Natural Community Conservation Plan and Habitat Conservation Plan. Part I: General Review of Approach, Methods, and Planning Principles, and Responses to Initial Questions. Merced, CA.

Noss, R., R. Amundson, D. Arnold, M. Bradbury, S. Collinge, B. Grewell, L. McKee, P. Northen, C. Swanson, and R. Yoshiyama. 2002. Report of Science Advisors, Solano County Natural Community Conservation Plan and Habitat Conservation Plan. Vacaville, CA.

Noss, R.F. 2001. Biocentric ecological sustainability: A citizen's guide. Biodiversity Legal Foundation, Louisville, CO.

Noss, R., E. Allen, G. Ballmer, J. Diffendorfer, M. Soulé, R. Tracy, and R. Webb. 2001. Independent science advisors' review: Coachella Valley Multiple Species Habitat Conservation Plan (MSHCP/NCCP). Conservation Science, Inc., Corvallis, OR.

Noss, R., P. Beier, D. Faulkner, R. Fisher, B. Foster, T. Griggs, P. Kelly, J. Opdycke, T. Smith, and P. Stine. 2001. Independent science advisors' review: North County Subarea Plan, County of San Diego, Multiple Species Conservation Program. Part I: Review of habitat conservation model, with suggestions for conservation planning principles, species coverage, and adaptive management.

Noss, R.F., G. Wuerthner, K. Vance-Borland, and C. Carroll. 2001. A Biological Conservation Assessment for the Greater Yellowstone Ecosystem: Report to the Greater Yellowstone Coalition. Conservation Science, Inc., Corvallis, OR.

Noss, R.F., G. Wuerthner, K. Vance-Borland, and C. Carroll. 2001. A Biological Conservation Assessment for the Utah-Wyoming Rocky Mountains Ecoregion: Report to The Nature Conservancy. Conservation Science, Inc., Corvallis, OR.

Carroll, C., R.F. Noss, and P.C. Paquet. 2000. Carnivores as focal species for conservation planning in the Rocky Mountain region. World Wildlife Fund Canada, Toronto, Ontario.

Noss, R.F., R. Graham, D. R. McCullough, F. L. Ramsey, J. Seavey, C. Whitlock, and M. P. Williams. 2000. Review of Scientific Material Relevant to the Occurrence, Ecosystem Role, and Tested Management Options for Mountain Goats in Olympic National Park. Report to U.S. Department of Interior, Washington, D.C.

Noss, R.F. 2000. Landscape species as conservation tools. Unpublished report. Wildlife Conservation Society, Bronx, New York.

Noss, R.F. 2000. Habitat fragmentation as a cumulative impact of winery expansion and other development in Napa County, California. Unpublished report. Sierra Club, San Francisco, CA.

Franklin, J., D. Perry, R. Noss, D. Montgomery, and C. Frissell. 2000. Simplified forest management to achieve watershed and forest health: a critique. Report of the Scientific Panel on Ecosystem Based Forest Management. National Wildlife Federation, Seattle, WA.

Noss, R.F. 2000. Wilderness biology and conservation: future directions. Pages 52-54 in D.N. Cole, S.F. McCool, W.A. Freimund, and J. O'Loughlin, compilers. Wilderness Science in a Time of Change Conference. Vol. I: Changing Perspectives and Future Directions. Proceedings RMRS-P-15-VOL-1.USDA Forest Service Rocky Mountain Research Station, Ogden, UT.

Noss, R.F. 1999. A citizen's guide to ecosystem management. Biodiversity Legal Foundation, Boulder, CO. (Distributed as Wild Earth Special Paper #3)

Noss, R.F., N.C. Slosser, J.R. Strittholt, and C. Carroll. 1999. Metrics of ecological integrity for terrestrial ecosystems and entire landscapes. U.S. Environmental Protection Agency, Washington, DC.

Noss, R.F. 1999. High-risk ecosystems as foci for considering biodiversity and ecological integrity in ecological risk assessments. U.S. Environmental Protection Agency, Washington, DC.

Strittholt, J.R., G.E. Heilman, and R.F. Noss. 1999. A GIS-based model for assessing conservation focal areas for the redwood ecosystem. Conservation Biology Institute, Corvallis, OR.

Strittholt, J.R., R.F. Noss, P.A. Frost, K. Vance-Borland, C. Carroll, and G. Heilman. 1999. A conservation assessment and science-based plan for the Klamath-Siskiyou ecoregion. Earth Designs Consultants, Inc. and Conservation Biology Institute, Corvallis, OR.

Carroll, C., P.C. Paquet, and R.F. Noss. 1999. Modeling carnivore habitat in the Rocky Mountain Region: A literature review and suggested strategy. World Wildlife Fund Canada, Toronto, Ontario.

Noss, R., M. Gordon, E. Hoagland, C. Lydeard, P. Mehlhop, and B. Roth. 1999. Report of Kanab Ambersnail Review Panel on Taxonomic, Ecological, and Translocation Issues Concerning the Conservation of *Oxyloma* Snails in Arizona and Utah. Report to Arizona Game and Fish Department. Phoenix, AZ.

Noss, R.F. 1997. A Big-Picture Approach to Forest Certification: A Report for World Wildlife Fund's Forests for Life Campaign in North America. World Wildlife Fund, Washington, DC.

Noss, R.F. 1997. The principles of conservation biology (in action). Pages 22-32 in S. Legault and K. Wiebe, eds. Connections: Proceedings of the First Conference on the Yellowstone to Yukon Conservation Initiative. Y2Y, Canmore, AB.

DellaSala, D.A., D.M. Olson, E. Dinerstein, W. Wettengel, R.F. Noss, and W.M. Eichbaum. 1997. Conservation status and importance of the Klamath-Siskiyou ecoregion. Pages 16-21 in J.K. Beigel, E.S. Jules, and B. Snitkin. 1997. Proceedings of the First Conference on Siskiyou Ecology. May 30-June 1, 1997. Siskiyou Regional Educational Project, Cave Junction, OR.

Vance-Borland, K., and R.F. Noss. 1997. An ecosystem classification and gap analysis of the Klamath-Siskiyou region. Pages 175-183 in J.K. Beigel, E.S. Jules, and B. Snitkin. 1997. Proceedings of the First Conference on Siskiyou Ecology. May 30-June 1, 1997. Siskiyou Regional Educational Project, Cave Junction, OR.

Noss, R.F. 1995. Maintaining Ecological Integrity in Representative Reserve Networks. World Wildlife Fund Canada, Toronto, Ont.

Noss, R.F., E.T. LaRoe, and J.M. Scott. 1995. Endangered Ecosystems of the United States: A Preliminary Assessment of Loss and Degradation. Biological Report 28. USDI National Biological Service, Washington, DC.

Noss, R.F. 1995. Biodiversity and Landscape Ecology: Wetland Restoration Policy. Technical Report, College of Oceanic and Atmospheric Sciences, Oregon State University, Corvallis, OR.

Noss, R.F., and R.L. Peters. 1995. Endangered Ecosystems of the United States: A Status Report and Plan for Action. Defenders of Wildlife, Washington, DC.

Noss, R.F. 1994. El Proyecto de Tierras Silvestres: Estrategia para la conservacíon de Áreas Naturales. Pages 323-365 in A. Vega, ed. Corredores Conservacionistas en la Región Centroamericana. Memorias de una Conferencia Regional auspiciada por el Proyecto Paseo Pantera. Heredia, Costa Rica, 17 al 20 de Septiembre de 1993. Tropical Research and Development, Gainesville, FL.

O'Leary, J.F., S.A. DeSimone, D.D. Murphy, P.F. Brussard, M.S. Gilpin, and R.F. Noss. 1994. Bibliographies on coastal sage scrub and related malacophyllous shrublands of other Mediterranean-type climates. California Wildlife Conservation Bulletin No. 10. California Department of Fish and Game, Sacramento, CA.

Noss, R.F. 1992. Biodiversity in the Blue Mountains: A framework for monitoring and assessment. Proceedings, Blue Mountains Biodiversity Conference, Whitman College, Walla Walla, WA, May 26-29, 1992.

Noss, R.F. 1992. Connectivity as a principle for regional conservation planning. Proceedings of the Workshop: Linkages, Corridors, and Connectivity. March 17-19, 1992. University of Florida, Gainesville, FL.

Noss, R.F. 1992. A Preliminary Biodiversity Conservation Plan for the Oregon Coast Range. Coast Range Association, Newport, OR.

Noss, R.F. 1992. Biodiversity: Many scales and many concerns. Pages 17-22 in H. Kerner, ed. Proceedings of the Symposium on Biodiversity of Northwestern California. Wildlands Resources Center, University of California, Berkeley, CA.

Noss, R.F. 1991. Federal Land Management Alternatives for Westside Forests: Effects on Wildlife and Biological Diversity. The Wilderness Society, Washington, DC.

Noss, R.F. 1991. Protecting Habitats and Biological Diversity: Design of Regional Reserve Systems. National Audubon Society, New York.

Noss, R.F. 1991. A Critical Review of the U.S. Fish and Wildlife Service's Proposal to Establish a Captive Breeding Population of Florida Panthers, with Emphasis on the Population Reestablishment Issue. Fund for Animals, Washington, DC.

Noss, R.F. 1991. Policy directions and management options for high-intensity fire habitats: Comments in panel discussion. Pages 393-394 in High Intensity Fire in Wildlands: Management Challenges and Options. Proceedings of the 17th Tall Timbers Fire Ecology Conference, May 18-21, Tallahassee, Florida. Tall Timbers Research Station, Tallahassee, FL.

Duever, L.C., and R.F. Noss, eds. 1990. Wiregrass Biology and Management: Maintaining Groundcover Integrity in Longleaf Pine Ecosystems. Proceedings of the Symposium, Oct. 13, 1988, Valdosta State College, GA. KBN Engineering and Applied Sciences, Inc. Gainesville, FL.

Scott, J.M., F. Davis, B. Csuti, B. Butterfield, R. Noss, S. Caicco, H. Anderson, J. Ulliman, F. D'Erchia, and C. Groves. 1990. Gap Analysis: Protecting Biodiversity Using Geographic Information Systems. U.S. Fish and Wildlife Service, Idaho Cooperative Fish and Wildlife Research Unit, University of Idaho, Moscow, ID.

Noss, R.F., and L.D. Harris. 1990. Connectivity and conservation of biological diversity: Florida as a case history. Pages 131-135 in Proceedings of the 1989 Society of American Foresters National Convention, Spokane, WA, September 24-27. Society of American Foresters, Bethesda, MD.

Noss, R.F., and R.F. Labisky. 1988. Sensitivity of Vertebrates to Development in Four Upland Community Types in Northern Peninsular Florida. Florida Game and Fresh Water Fish Commission, Tallahassee, FL.

Harris, L.D., and R.F. Noss. 1987. Endangerment with the best of intentions. Pages 31-38 in R. Fitter and M. Fitter, eds. Proceedings of a Symposium held by the Species Survival Commission, Madrid, 7-9 Nov., 1984. International Union for Conservation of Nature and Natural Resources, Gland, Switz.

Brown, M.T., J.M. Schaefer, K.H. Brandt, S.J. Doherty, C.D. Dove, J.P. Dudley, D.A. Eifler, L.D. Harris, R.F. Noss, and R.W. Wolfe. 1987. An Evaluation of the Applicability of Upland Buffers for the Wetlands of the Wekiva Basin. Center for Wetlands, University of Florida. 163 p.

Duever, L.C., R.W. Simons, R.F. Noss, and J.R. Newman. 1987. Comprehensive Inventory of Natural Ecological Communities in Alachua County. KBN Engineering and Applied Sciences. Gainesville, Florida.

Noss, R.F., H.W. Kale, and C.W. Biggs. 1985. Florida Breeding Bird Atlas: Handbook for Cooperators. Florida Audubon Society, Maitland, Florida. 28 pp.

Noss, R.F. 1985. Landscape Considerations in Reintroducing and Maintaining the Florida Panther: Design of Appropriate Preserve Networks. Report to the Florida Panther Technical Advisory Council. 32 pp. + figures.

Cristoffer, C., R.F. Noss, and J.F. Eisenberg. 1985. Report No. 3. On the captive breeding and reintroduction of the Florida panther into suitable habitats. Report to Florida Game & Fresh Water Fish Commission, Tallahassee, FL.

Noss, R.F. 198l. Birds of Ohio: a Field Checklist. Ohio Department of Natural Resources. 12 pp.

***Other Articles (Letters, Editorials, Forewords, Book Reviews, etc.)***

Noss, R.F. 2017. Foreword to The Outdoor Classroom. Southeastern Naturalist 16 (Special Issue 10):ii-iii.

Johns, D., J. Terborgh, K.F. Beazley, J.A. Estes, D. Foreman, B. Miller, R. Noss, M. Soulé, and W.J. Ripple. 2017. We need a biologically sound North American conservation plan. BioScience.

Noss, R.F. 2017. Exploring the minds of predators. Carnivore Minds: Who These Fearsome Animals Really Are, G.A. Bradshaw. Biological Conservation 211:172-173.

Noss, R., and R. Sanjayan. 2016. Perspectives on natural areas and conservation. Natural Areas Journal 36:243-247.

Pannozzo, P., and R. Noss. 2014. Planning for the conservation of Nature in Florida: current trends, future opportunities. Florida Planning Summer 2014:16-18.

Reece, J.S., and R.F. Noss. 2014. Investigating the effects of shoreline development and climate change on loggerhead nesting habits. Quest 15(2)12-15.

Noss, R., R. Nash, P. Paquet, and M. Soulé. 2013. Humanity's domination of Nature is part of the problem: a response to Kareiva and Marvier. BioScience 63:241-242.

Noss, R.F. 2011. Foreword. Pages xiii-xv in S.E. Hanser, M. Leu, S.T. Knick, and C.L. Aldridge, editors. Sagebrush Ecosystem Conservation and Management: Ecoregional Assessment Tools and Models for the Wyoming Basins. Allen Press, Lawrence, KS.

Carroll, C., R.F. Noss, J. Hilty, and S.C. Trombulak. 2009. Solving SCB's membership crisis by reinvigorating the sections: response to Schwartz et al. Conservation Biology 23:5-6.

Noss, R.F. 2007. Six reasons to join your regional section. Society for Conservation Biology Newsletter 14(2):1, 10.

Meffe, G.K., D. Ehrenfeld, and R. Noss. 2006. Conservation biology at twenty. Conservation Biology 20:595-596.

Noss, R.F. 2006. Editor's introduction. Pages 1-3 in The Breeding Birds of Florida, Parts I and II. Special Publication No. 7. Florida Ornithological Society, Gainesville, FL.

Carroll, C., R.F. Noss, and P.C. Paquet. 2004. A proposed wildlands network for carnivore conservation in the Rocky Mountains. Wild Earth 14 (1/2):28-33.

Switalski, A., and R. Noss. 2004. The evolution of road science. Road-RIPorter 9(3):6-9.

Noss, R.F. 2004. What have we learned about connectivity? Wild Earth 14(3/4):12-15.

Noss, R.F. 2003. Another dead diamondback. Wild Earth 13(2/3):33-37.

Noss, R.F. 2002. Context matters: Considerations for large-scale conservation. Conservation in Practice 3(3):10-19.

Noss, R.F. 2001/2002. Citizen scientist or amateur naturalist? Wild Earth 11(3/4):14-17.

Noss, R.F. 2001. Review of Carnivores in Ecosystems: The Yellowstone Experience (Clark et al., eds.) . Conservation Biology 15:293-294.

Noss, R.F. 2001. Toward a pro-life politics. 2001. Conservation Biology 15:827-828.

Noss, R.F. 2001. Review of Forest Fragmentation in the Southern Rocky Mountains (Knight et al., eds.). Landscape Ecology 16:371-372.

Noss, R., and M. Hunter. 2001. From assemblage to community. Conservation Biology 15:1201-1202.

Noss, R.F. 2001. Review of The Historical Ecology Handbook: A Restorationist's Guide to Reference Ecosystems (Egan and Howell, eds.). Ecological Restoration 19:273-274.

Noss, R.F. 2001. Review of Precious Heritage: The Status of Biodiversity in the United States (Stein et al., eds.). Restoration Ecology 9:476-477.

Miller, B., B. Dugelby, D. Foreman, C. Martinez del Rio, R. Noss, M. Phillips, R. Reading, M.E. Soulé, J. Terborgh, and L. Willcox. 2001. The importance of large carnivores to healthy ecosystems. Endangered Species Update 18:202-210.

Noss, R.F. 2000. Three ways to heal the West. Sierra.March/April 2000:59.

Noss, R.F. 2000. Science on the bridge. Conservation Biology 14:333-335.

Noss, R. 1999/2000. A reserve design for the Klamath-Siskiyou ecoregion. Wild Earth 9(4):71-76.

Noss, R.F. 1999/2000. The warrior naturalists. Defenders 75(1):21.

Noss, R.F. (1999, reprinted from 1990). The ecological effects of roads or the road to destruction. Resources for Road-Rippers: 2-12

Noss, R.F. 1999. The President's Column: Dreams of a millennial president. Society for Conservation Biology Newsletter 6(3):1, 7.

Miller, B., R. Reading, J. Strittholt, C. Carroll, R. Noss, M. Soulé, O. Sanchez, J. Terborgh, D. Brightsmith, T. Cheeseman, and D. Foreman. 1998/99. Using focal species in the design of nature reserve networks. Wild Earth 8(4):81-92.

Noss, R.F. 1998. Does conservation biology need natural history? Wild Earth 8(3):10-14.

Soulé, M., and R. Noss. 1998. Rewilding and biodiversity: complementary goals for continental conservation. Wild Earth 8(3):18-28.

Noss, R.F. 1997. Foreword. Pages iii-iv in T.N. Kaye, A. Liston, R.M. Love, D.L. Luoma, R.J. Meinke, and. M.V. Wilson, eds. Conservation and Management of Native Plants and Fungi: Proceedings of an Oregon Conference on the Conservation and Management of Native Vascular Plants, Bryophytes, and Fungi. Native Plant Society of Oregon, Corvallis, OR.

Noss, R.F. 1997. Reinterpreting sustainability. Review of Last Stand: Protected Areas and the Defense of Tropical Biodiversity, edited by R. Kramer, C. van Schaik, and J. Johnson. Trends in Ecology and Evolution 12:450-451.

Noss, R.F. 1997. The failure of universities to produce conservation biologists. Conservation Biology 11: 1267-1269.

Noss, R.F. 1996. Conservation biology, values, and advocacy. Conservation Biology 10:904.

Noss, R.F. 1996. The naturalists are dying off. Conservation Biology 10:1-3.

Noss, R.F. 1996. Do Eastside forests need restoration or crown fires? Wild Earth 6(2):9-11.

Noss, R.F. 1996. Foreword. Pages xi - xii in D.A. Falk, C.I. Millar, and M. Olwell, eds. Restoring Diversity: Strategies for Reintroduction of Endangered Plants. Center for Plant Conservation and Island Press, Washington, DC.

Noss, R.F. 1996. Conservation or convenience? Conservation Biology 10:921-922.

Noss, R.F. 1995/96. Science grounding strategy: Conservation biology in wildlands work. Wild Earth 5(4): 17-19.

Noss, R.F. 1995/96. What should endangered ecosystems mean to The Wildlands Project? Wild Earth 5(4): 20-29.

Vance-Borland, K., R. Noss, J. Strittholt, P. Frost, C. Carroll, and R. Nawa. 1995/96. A biodiversity conservation plan for the Klamath/Siskiyou region: A progress report on a case study for bioregional conservation. Wild Earth 5(4): 52-59.

Noss, R.F. 1995. Foreword. Pages xiii-xv in L. Hansson, L. Fahrig, and G. Merriam, eds. Mosaic Landscapes and Ecological Processes. IALE Studies in Landscape Ecology 2. Chapman and Hall, New York.

Noss, R.F. 1995. Foreword. Pages x - x in CREILG Special Project Team. Atlas of the Central Rockies Ecosystem: Toward an Ecologically Sustainable Landscape. Komex International, Ltd., Calgary, Alberta.

Noss, R.F., and D.D. Murphy. 1995. Endangered species left homeless in Sweet Home. Conservation Biology 9: 229-231.

Noss, R.F. 1995. The perils of Pollyannas. Conservation Biology 9: 701-703.

Noss, R.F. 1994/95. Wilderness--Now more than ever (A response to Callicott). Wild Earth 4(4): 60-63.

Murphy, D., D. Wilcove, R. Noss, J. Harte, C. Safina, J. Lubchenco, T. Root, V. Sher, L. Kaufman, M. Bean, and S. Pimm. 1994. On reauthorization of the Endangered Species Act. Conservation Biology 8: 1-3.

Noss, R.F. 1994. Cows and conservation biology. Conservation Biology 8: 613-616.

Noss, R.F. 1993. Review of Nature Conservation 2: The Role of Corridors, by D.A. Saunders and R.J. Hobbs. Journal of Wildlife Management 57: 191-192.

Noss, R.F. 1993. Whither conservation biology? Conservation Biology 7: 215-217.

Brussard, P.F., D.D. Murphy, and R.F. Noss. 1992. Strategy and tactics for conserving biological diversity in the United States. Conservation Biology 6: 157-159.

Noss, R.F. 1992. The Wildlands Project: Land conservation strategy. Wild Earth (Special Issue): 10-25.

Foreman, D., J. Davis, D. Johns, R. Noss, and M. Soulé. 1992. The Wildlands Project mission statement. Wild Earth (Special Issue): 3-4.

Noss, R.F. 1991/92. Biologists, biophiles, and warriors. Wild Earth 1(4): 56-60.

Noss, R.F. 1991. Sustainability and wilderness. Conservation Biology 5: 120-122.

Noss, R.F. 1991. Review of Wildlife, Forests, and Forestry: Principles of Managing Forests for Biological Diversity, by Malcolm L. Hunter, Jr. Forest Perspectives 1(1): 18.

Noss, R.F. 1989. Who will speak for biodiversity? Conservation Biology 3: 102-103.

Noss, R.F., and S. Henderson. 1989. Biodiversity: A new focus for environmental protection. Habitat Futures, Summer 1989: 13-14.

Noss, R.F. 1989. A history of predator control. Review of Saving America's Wildlife, by T.R. Dunlap. Trends in Ecology and Evolution 4: 358.

Noss, R.F. 1988. The longleaf pine landscape of the Southeast: almost gone and almost forgotten. Endangered Species Update 5 (5): 1-8.

Noss, R.F. 1987. Do we really want diversity? Whole Earth Review 55: 126-128

Noss, R.F. 1987. Saving species by saving ecosystems: A review of The Preservation of Species: The Value of Biological Diversity, ed. by Brian G. Norton. Conservation Biology 1: 175-177.

Noss, R.F. 1987. Florida's National Forests: Our last chance. ENFO 87(6): 1-14.

Noss, R.F. 1986. Conservation Guidelines: Florida Native Plant Society. The Palmetto 6(2): 12-13.

Noss, R.F. 1985. Rescue or abuse? The Palmetto 4(4): 12.

Noss, R.F. 1984. About not knowing everything (Guest Editorial). Restoration and Management Notes 2(1): 3.

Noss, R.F. 1983. Re-creating an Ohio Valley wilderness. Midwest Earth Advocate 1(1): 4.

Noss, R.F. 1983. Birds as preserve management indicators: regional perspective urged. Restoration and Management Notes 1(3): 29.

Noss, R.F. 1982. Conservation in and out of nature preserves. Ohio Journal of Science 82: 101.

Noss, R.F. 1980. Caving for gray bats in Kentucky. The Explorer 22(4): 22-27.