FEDERAL COMMUNICATIONS COMMISSION

47 CFR Parts 1 and 2

[ET Docket No. 00–47; FCC 00–430]

Software Defined Radios

AGENCY: Federal Communications Commission.

ACTION: Proposed rule.

SUMMARY: This document proposes to streamline the equipment authorization procedures for software defined radios. Specifically, we propose to define software defined radios as a new class of equipment with equipment authorization rules that reflect the additional flexibility incorporated into such radios. We believe that these changes will facilitate the deployment and use of this new promising technology. The frequency and technology agility of software defined radios could increase the use of presently underutilized frequency bands.

DATES: Comments must be submitted on or before March 19, 2001, and reply comments on or before May 18, 2001.

ADDRESSES: All filings must be sent to the Commission's Secretary, Magalie Roman Salas, Office of Secretary, Federal Communications Commission, 445 12th Street, SW., TW–A325, Washington, DC 20554.

FOR FURTHER INFORMATION CONTACT: Hugh Van Tuyl, Office of Engineering and Technology, (202) 418–7506.

SUPPLEMENTARY INFORMATION: This is a summary of the Commission's *Notice of Proposed Rule Making,* ET Docket 00–47, FCC 00–430, adopted December 7, 2000, and released December 8, 2000. The full text of this Commission decision is available on the Commission's Internet site, at *www.fcc.gov.* It is also available for inspection and copying during normal business hours in the FCC Reference Information Center, Room CY–A257, 445 12th Street, SW, Washington, DC, and also may be purchased from the Commission's duplication contractor, International Transcription Service, (202) 857–3800, 1231 20th Street, NW Washington, DC 20036. Comments may be sent as an electronic file via the Internet to *http://www.fcc.gov/e-file/ecfs.html,* or by e-mail to ecfs@fcc.gov.

Summary of the Notice of Proposed Rule Making

1. The Notice of Proposed Rule Making (NPRM) responds to a Notice of Inquiry (NOI) in this proceeding, 65 FR 17246, March 31, 2000. The NOI sought comments on a number of issues related to software defined radios. These issues included the current state of technology, how this technology could facilitate interoperability between radio services, how it could improve spectrum efficiency and spectrum sharing, and what changes may be required in the equipment approval process.

2. The NPRM proposes to amend part 2 of our rules to streamline the equipment authorization procedures for software defined radios (SDR). Specifically, we propose to define software defined radios as a new class of equipment with equipment authorization rules that reflect the additional flexibility incorporated into such radios. We propose to permit equipment manufacturers to make changes in the frequency, power and modulation of such radios without the need to file a new equipment authorization application with the Commission. We also propose to permit electronic labeling so that a third party may modify a radio's technical parameters without having to return to the manufacturer for re-labeling. We believe that these changes will facilitate the deployment and use of this new promising technology. The frequency and technology agility of software defined radios could increase the use of presently underutilized frequency bands.

3. We recognize that there is no universally accepted definition of a software defined radio. We stated in the NOI that many radios now contain microprocessor technology that can control functions such as frequency and power. Until recently, these functions were controlled by firmware installed at the factory and are not readily changeable by the user. To facilitate the development of these types of radios, we propose a new, more flexible equipment approval process. We propose the following definition of software defined radio to delineate what types of devices fall within the proposed new rules.

> A software defined radio is a radio that includes a transmitter in which the operating parameters of the transmitter, including the frequency range, modulation type or maximum radiated or conducted output power can be altered by making a change in software without making any hardware changes.

We seek comments on the sufficiency of this definition or any alternative definitions that may be more appropriate.

4. We believe that some relaxation of the current equipment authorization procedures is appropriate. Thus, we propose to develop a more streamlined authorization procedure for changes to software defined radios. Specifically, we propose that changes in the frequency, power, and modulation type of a software defined radio could be authorized as a new class of permissive change, which we propose to designate as Class III. This would eliminate the need to re-label equipment when new software is loaded and would streamline the filing procedure for changes to approved devices. Software changes that do not affect these operating parameters would be treated as Class I permissive changes, so no filing would be required for them. The applicant for a Class III change would submit test data showing that the equipment complies with the applicable requirements for the service(s) or rule parts under which it will operate with the new software loaded. The applicant would also have to demonstrate compliance with the applicable RF exposure requirements. The Commission would notify the applicant by letter when a permissive change is granted. Once a Class III permissive change has been granted for new software that affects the operating parameters, the software could be loaded into units in the field. The record in the Commission's database for each authorized device would show the approved frequency range(s), power and modulation type(s) as it does now. Additional frequency ranges or other new technical parameters would be added to the database record for an authorization when a permissive change is granted.

5. We propose that the original certification application must identify the equipment as a software defined radio, and that only the grantee of the authorization for a software defined radio may file for a Class III permissive change. We also propose that Class III permissive changes may only be made to equipment in which no hardware changes have been made from the originally approved device to eliminate ambiguity about which hardware and software combinations have been approved. We recognize that while the filing procedure for permissive changes is streamlined, Commission staff is still required to perform a technical review of the new test data for compliance with the rules. Therefore, we propose to apply the filing fee for certification of transmitters used in licensed services to the new Class III permissive changes to reflect the staff time required to process these changes.

6. We seek comments on whether a new class of permissive change should be established, the type of information that should be submitted to show compliance with the service rules and

RF exposure requirements, the appropriate filing fee for such changes, whether parties other than the grantee should be allowed to file for permissive changes.

7. In addition, we seek comments on whether this new class of permissive change should be limited to software changes only, whether we should allow a combination of hardware and software permissive changes in a single device, whether there is a need for applicants to submit a copy of radio software to the Commission, and whether we should place limits on the number of hardware and software combinations under a single approval. We further seek comment on the benefits of the proposed new permissive change compared to the existing requirement for new identification numbers if we allow the alternative labeling method described in the NPRM.

8. We believe that a major benefit of software defined radios will be the ability of manufacturers to produce radios intended to be programmed by third parties with unique or specialized application software. To help realize this benefit, we are proposing an option for software defined radios to be equipped with an ''electronic label'' to display the FCC identification number by means of a light emitting diode (LED) display, a liquid crystal display (LCD) screen or other similar method. This would provide a method to re-label equipment in the field if a new approval were obtained by a third party for a previously approved device. The information would have to be readily accessible in a manner that allows it to be easily viewed. We request comments on this proposal, including whether there is a need for this capability, the type of display that should be required, the means that should be required for accessing the information, and the information to be displayed. We recognize that not all transmitters that are potentially programmable would normally have an LED, LCD or similar display, so we also request comments on whether manufacturers would need to add such displays to take advantage of the electronic labeling capability. We also seek comments on whether electronic labeling should be permitted for other types of equipment besides software defined radios.

9. We tentatively conclude that a means will be necessary to avoid unauthorized modifications to software that could affect the compliance of a radio. While we believe we may eventually have to adopt rules addressing software authentication, we believe it would be premature for us to propose specific requirements for authentication while standards are still under development. Accordingly, at this time we are proposing a more general requirement that manufacturers must take steps to ensure that only software that is part of a hardware/software combination approved by the Commission or a TCB can be loaded into a radio. The software must not allow the user to operate the radio with frequencies, output power, modulation types or other parameters outside of those that were approved. Manufacturers may use authentication or any other means to meet these requirements, and must describe the methods in their application for equipment authorization. The grantee of an equipment authorization is responsible for ensuring the integrity of the authentication or security system. Failure to do so could result in the revocation of the authorization. We believe that this proposal would protect against harmful interference and safety hazards from software defined radios without interfering with the development of the technology. We request comments on this proposal, including whether it could impede legitimate third party software developers from developing applications for software defined radios. We also seek comments on the types of authentication standards that are likely to be developed, whether the standards should be industry developed or government sponsored, whether the standards should be voluntary or mandatory, and whether these standards would be applicable to all types of software defined radio equipment.

10. We believe that the rule changes we are proposing will allow manufacturers greater flexibility in obtaining approval for software defined radios and will facilitate deployment of this equipment to consumers. We further believe that the proposed requirements for authentication of software will provide a safeguard against unauthorized modifications of approved equipment. However, we recognize that a non-compliant software defined radio has the potential to interfere with other radio services due to its potential to operate in multiple frequency bands. Therefore, we request comments on whether we should enhance our enforcement capabilities and what particular changes we should make. For example, should we establish requirements prohibiting manufacturers or grantees from knowingly marketing software that would cause a software defined radio to operate in violation of the Commission's rules? We request comments on this and any other matters that may be pertinent to software defined radios.

Initial Regulatory Flexibility Analysis

11. As required by the Regulatory Flexibility Act (RFA),[1] the Commission has prepared this present Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact on small entities by the policies and rules proposed in this *Notice of Proposed Rule Making (NPRM).* Written public comments are requested on this IRFA. Comments must be identified as responses to the IRFA and must be filed by the deadlines for comments provided in paragraph 38 of this NPRM. The Commission will send a copy of this NPRM, including this IRFA, to the Chief Counsel for Advocacy of the Small Business Administration (SBA).[2] In addition, the NPRM and IRFA (or summaries thereof) will be published in the **Federal Register**.[3]

A. Need for, and Objectives of, the Proposed Rules

12. A number of parties are currently developing software defined radio technology. In a software defined radio, functions that were carried out by hardware in the past are performed by software. This means that the operating parameters of the radio, such as the frequency and type of modulation, could be readily changed in the field. The current rules do not prohibit software programmable radios. However, they require a new approval and a new identification number on a permanently affixed label when changes to the frequency, power or type of modulation are made. The requirement to re-label equipment in the field when a change is made could tend to discourage deployment of software defined radios to consumers. Therefore, we are proposing changes to our equipment authorization rules to facilitate such deployment. These changes would streamline the equipment approval process for software defined radios and would reduce the filing burden on applicants.

B. Legal Basis

13. The proposed action is authorized under Sections 4(i), 301, 302, 303(e), 303(f), 303(r), 304 and 307 of the Communications Act of 1934, as

[1] *See* 5 U.S.C. 603. The RFA, see 5 U.S.C. 601 *et. seq.,* has been amended by the Contract With America Advancement Act of 1996, Public Law 104–121, 110 Stat. 847 (1996) (CWAAA). Title II of the CWAAA is the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA).

[2] See 5 U.S.C. 603(a).

[3] See id.

amended, 47 U.S.C. 154(i), 301, 302, 303(e), 303(f), 303(r), 304 and 307.

C. Description and Estimate of the Number of Small Entities to Which the Proposed Rules Will Apply

14. The RFA directs agencies to provide a description of and, where feasible, an estimate of the number of small entities that may be affected by the proposed rules, herein adopted.[4] The RFA generally defines the term ''small entity'' as having the same meaning as the terms ''small business,'' ''small organization,'' and ''small governmental jurisdiction.'' [5] In addition, the term ''small business'' has the same meaning as the term ''small business concern'' under the Small Business Act.[6] A small business concern is one which: (1) Is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the SBA.[7]

15. The Commission has not developed a definition of small entities applicable to Radio Frequency Equipment Manufacturers (RF Manufacturers). Therefore, the applicable definition of small entity is the definition under the SBA rules applicable to manufacturers of ''Radio and Television Broadcasting and Communications Equipment.'' According to the SBA's regulation, an RF manufacturer must have 750 or fewer employees in order to qualify as a small business.[8] Census Bureau data indicates that there are 858 companies in the United States that manufacture radio and television broadcasting and communications equipment, and that 778 of these firms have fewer than 750 employees and would be classified as small entities.[9] We believe that many of the companies that manufacture RF equipment may qualify as small entities.

D. Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements

16. We propose to establish a new class of ''permissive change'' for software defined radios when changes are made to the software that affect the frequency, power or type of modulation. This class of change would require the manufacturer to submit a description of the software changes to the FCC or a designated Telecommunications Certification Body (TCB). The manufacturer would also be required to submit test data showing that the radio complies with the technical standards in our rules with the new software loaded. The new software could not be loaded into radios until the FCC or TCB notifies the manufacturer that the changes are acceptable. The original FCC identification number for the equipment could continue to be used, so no re-labeling would be required.

17. We also proposed to allow an ''electronic label'' to be used on software defined radio transmitters as an alternative to the permanently affixed label the rules currently require. The equipment would display the FCC identification number by means of a liquid crystal display or similar screen.

18. We further proposed that manufacturers must take steps to ensure that only software that has been approved by the FCC or a TCB can be loaded into a transmitter. The software must not allow the user to operate the transmitter with frequencies, output power, modulation types or other parameters outside of those that were approved. Manufacturers may use authentication codes or any other means to meet these requirements, and must describe the methods in their application for equipment authorization.

E. Steps Taken To Minimize Significant Economic Impact on Small Entities, and Significant Alternatives Considered

19. The RFA requires an agency to describe any significant alternatives that it has considered in reaching its proposed approach, which may include the following four alternatives (among others): (1) The establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance or reporting requirements under the rule for small entities; (3) the use of performance, rather than design, standards; and (4) an exemption from coverage of the rule, or any part thereof, for small entities.

20. We considered three alternatives to streamline the requirements for software defined radios, which will reduce the burden on small entities.

(a) The first alternative, which we proposed in the NPRM, would permit changes in the frequency, power, and modulation type of a software defined radio to be authorized as a new class of permissive change. A new FCC identification number is not required for permissive changes, so there would be no need to re-label equipment when new software that changes the operating parameters is loaded. Permissive changes only require filing test data showing that the equipment complies with the applicable requirements in the rules with the new software. A complete application with exhibits including block diagrams, schematic diagrams, photographs and the users' manual is not required. Only the party holding the grant of equipment authorization my file for permissive changes.

(b) The second alternative, which we proposed as an option in the NPRM, is to allow the FCC identification number to be displayed electronically rather than on a permanently affixed label. A major benefit of software defined radios will be the ability of manufacturers to produce radios intended to be programmed by third parties, including small entities, which could develop unique or specialized application software. The ''electronic label'' would help realize this benefit. It would provide a method to re-label equipment in the field without having to change a physical label if a new approval were obtained by a third party for a previously approved device.

(c) The third alternative we considered is to allow software changes to be approved under the Declaration of Conformity (DoC) procedure. DoC is a self-approval procedure in which the manufacturer has the equipment tested for compliance at an accredited laboratory. Once the equipment has been found to comply, it may be marketed without any approval from the FCC or a TCB. Although this alternative would reduce the burden on small entities, we declined to propose it because we believe that most radio transmitters require a higher level of oversight to ensure that they comply with the rules to prevent interference and protect users from excessive RF radiation. Certain radio transmitters are already permitted to be self-approved, and we are not proposing any change in the authorization requirements for them.

[4] 5 U.S.C. 603(b)(3).

[5] Id. 601(6).

[6] 5 U.S.C. 601(3) (incorporating by reference the definition of ''small business concern'' in 15 U.S.C. 632). Pursuant to the RFA, the statutory definition of a small business applies ''unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the **Federal Register**.'' 5 U.S.C. 601(3).

[7] Small Business Act, 15 U.S.C. 632 (1996).

[8] See 13 CFR 121.201, Standard Industrial Classification (SIC) Code 3663.

[9] See U.S. Department of Commerce, 1992 Census of Transportation, Communications and Utilities (issued May 1995), SIC category 3663.

F. Federal Rules That May Duplicate, Overlap, or Conflict With the Proposed Rule

21. None.

22. Accordingly, *It is Ordered* that pursuant to the authority contained in sections 4(i), 301, 302, 303(e), 303(f), 303(r), 304 and 307 of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154(i), 301, 302, 303(e), 303(f), 303(r), 304, and 307, this Notice of Proposed Rule Making *Is Adopted.*

23. *It is Further Ordered* that the Commission's Consumer Information Bureau, Reference Information Center, *Shall Send* a copy of this NPRM, including the Initial Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

List of Subjects

47 CFR Part 1

Administrative practice and procedure.

47 CFR Part 2

Communications equipment, Radio.

Federal Communications Commission.

William F. Caton,

Deputy Secretary.

Proposed Rules

For the reasons discussed, parts 1 and 2 of title 47 of the Code of Federal Regulations are proposed to be amended as follows:

PART 1—PRACTICE AND PROCEDURE

1. The authority citation for part 1 continues to read as follows:

Authority: 47 U.S.C. 151, 154(i), 154(j), 155, 225, 303(r), 309.

2. Section 1.1103 is amended by adding a new entry to the table to read as follows:

§ 1.1103 Schedule of charges for equipment authorization, experimental radio services, and international telecommunications settlements.

Action	FCC Form No.	Fee amount	Payment type code	Address
1. Certification				
* *	*	*	*	* *
f. Class III permissive changes	731 & 159	495	ECC	Federal Communications Commission, Equipment Approval Services, P.O. Box 358315, Pittsburgh, PA 15251–5315.
* *	*	*	*	* *

PART 2—FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS

3. The authority citation for part 2 continues to read as follows:

Authority: 47 U.S.C. 154, 302a, 303, and 336, unless otherwise noted.

4. In § 2.1, paragraph (c) is amended by adding the following definition in alphabetical order to read as follows:

§ 2.1 Terms and definition.

* * * * *

(c) * * *

Software defined radio. A radio that includes a transmitter in which the operating parameters of the transmitter, including the frequency range, modulation type and maximum radiated or conducted output power can be altered by making a change in software without making any hardware changes.

* * * * *

5. Section 2.925 is amended by redesignating paragraphs (e) and (f) as (f) and (g), respectively, and by adding a new paragraph (e) to read as follows:

§ 2.925 Identification of equipment.

* * * * *

(e) A software defined radio may be equipped with a means such as a user display screen to display the information normally contained in the nameplate or label. The information must be readily accessible.

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6. Section 2.932 is amended by adding paragraph (e) to read as follows:

§ 2.932 Modification of equipment.

* * * * *

(e) Manufacturers must take steps to ensure that only software that has been approved by the FCC or a TCB can be loaded into a transmitter. The software must not allow the user to operate the transmitter with frequencies, output power, modulation types or other parameters outside of those that were approved. Manufacturers may use authentication codes or any other means to meet these requirements, and must describe the methods in their application for equipment authorization.

7. Section 2.1043 is amended by revising paragraphs (a) and (b) to read as follows:

§ 2.1043 Changes in certificated equipment.

(a) Except for Class III permissive changes, changes to the basic frequency determining and stabilizing circuitry (including clock or data rates), frequency multiplication stages, basic modulator circuit or maximum power or field strength ratings shall not be performed without application for and authorization of a new grant of certification. Variations in electrical or mechanical construction, other than these indicated items, are permitted provided the variations either do not affect the characteristics required to be reported to the Commission or the variations are made in compliance with the other provisions of this section.

(b) Three classes of permissive changes may be made in certificated equipment without requiring a new application for and grant of certification. None of the classes of changes shall result in a change in identification.

(1) A Class I permissive change includes those modifications in the equipment which do not degrade the characteristics reported by the manufacturer and accepted by the Commission when certification is granted. No filing with the Commission is required for a Class I permissive change.

(2) A Class II permissive change includes those modifications which degrade the performance characteristics as reported to the Commission at the time of the initial certification. Such degraded performance must still meet the minimum requirements of the applicable rules. When a Class II permissive change is made by the grantee, the grantee shall supply the Commission with complete information and the results of tests of the characteristics affected by such change. The modified equipment shall not be

marketed under the existing grant of certification prior to acknowledgement by the Commission that the change is acceptable.

(3) A Class III permissive change includes modifications to the software of a software defined radio transmitter that affect the frequency, modulation type, output power or maximum field strength. When a Class III permissive change is made, the grantee shall supply the Commission with a description of the changes and test results showing that the equipment complies with the applicable rules with the new software loaded, including compliance with the applicable RF exposure requirements. The modified software shall not be loaded into equipment, and the equipment shall not be marketed with the modified software under the existing grant of certification, prior to acknowledgement by the Commission that the change is acceptable.

(4) Class III permissive changes may only be made by the original grantee. Class I and Class II permissive changes may only be made by the original grantee, except as specified further.

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[FR Doc. 01–63 Filed 1–2–01; 8:45 am]

BILLING CODE 6712–01–U

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

RIN 1018–AF67

Endangered and Threatened Wildlife and Plants; Reopening of Comment Period on the Proposed Rule To Remove the Northern Populations of the Tidewater Goby From the List of Endangered and Threatened Wildlife

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule; reopening of comment period.

SUMMARY: The U.S. Fish and Wildlife Service (Service) gives notice of the reopening of the comment period for the proposed removal of the northern populations of the tidewater goby (*Eucyclogobius newberryi*) from the list of endangered and threatened wildlife. The new comment period will allow all interested parties another opportunity to submit comments on our assertions, as clarified in this notice, that the original listing rule exaggerated the risk of extinction by overestimating the rate of local population extinction, and that the northern populations of the tidewater goby are not presently in danger of extinction or likely to become in danger of extinction within the foreseeable future. We are re-opening the comment period to clarify some points in our proposal and to solicit further public and peer-review comment.

DATES: The comment period for this proposal closes on February 2, 2001. Comments on the proposed delisting must be received by the closing date.

ADDRESSES: Written comments should be sent to the Regional Director, Regional Office, U.S. Fish and Wildlife Service, 911 NE 11th Avenue, Portland, Oregon 97232–4181. Comments and materials received will be available for public inspection, by appointment, during normal business hours at the above Service address.

FOR FURTHER INFORMATION CONTACT: Catrina Martin or Steve Morey at the above address; telephone 503/231–6131; facsimile 503/231–6243.

SUPPLEMENTARY INFORMATION:

Background

Shortly after the tidewater goby was listed as endangered in 1994, the Service initiated the recovery planning process. A contractor was hired to write a draft recovery plan and the product was a draft commonly referred to as the Swift 1995 version. This version was revised slightly in response to internal review and a revision under the authorship of Ballard and Swift was circulated among various experts and the applicable Service field offices in June 1996. Finally, in late September, 1996, a revised draft, authored by Ballard was forwarded to the Regional Office for review. In the 31 months since the listing, the Service had, in the process of drafting the recovery plan, compiled a fairly up-to-date record of what was known about the status of the goby. The goby seemed particularly responsive to climatic cycles, and the trend to extinction had not played out as projected in the 1994 listing. A number of estuaries cited in the listing rule as lacking gobies, symptomatic of the presumed range-wide decline, were in fact, inhabited by gobies. There seemed to be little actual evidence that the distribution and abundance, or overall risk of extinction had changed appreciably since 1982 when the tidewater goby was designated a category 2 candidate (47 FR 58454). Did the goby need a recovery plan, or was the original concern about extinction exaggerated? In order to decide whether to proceed with a recovery plan or to delist, a review of the merits of the original listing, and the current status of the species was initiated. The 1999 proposal to delist the goby summarizes the results of that review and concludes that delisting the tidewater goby north of Orange County is the most appropriate action.

On June 24, 1999, we published a proposed rule to remove from the list of endangered and threatened wildlife those populations of tidewater goby that occur north of Orange County, California, and to retain a distinct population segment of tidewater goby in Orange and San Diego counties as an endangered species (64 FR 33816). We proposed to delist the northern populations because our original conclusions about population trends and were either in error or not adequately supported by the best available biological information. We believe that the original listing rule (59 FR 5954) overestimated the risk of extinction and the tidewater goby may have been mistakenly listed as endangered.

The 1994 rule that listed the tidewater goby as endangered painted a picture of rapid local disappearances leading to extinction. The decline of the goby was considered to be so precipitous and the threats so severe that the conclusion of the summary of factors affecting the species was: ''The tidewater goby is in imminent danger of extinction throughout its range and requires the full protection of listing as endangered under the Act to survive'' (59 FR 5954). Our 1999 delisting proposal explains that the original listing inappropriately combined older permanent extinctions with temporary, drought-related extinctions to give an exaggerated impression of the rate of decline. The proposed delisting rule also argues that the original listing mistakenly assumes that because of reduced opportunities for gobies to naturally recolonize via dispersal, the species was headed toward extinction or listing under the Act. The relationship between extinction and dispersal is illustrated in the original listing with the following statement: ''The number of extirpated localities of gobies has left the remaining populations so widely separated throughout most of the species' range that recolonization is unlikely.'' The delisting proposal explains that gobies are now present in the majority of the approximately twenty estuaries where they were reported as lost between 1984 and 1990. In most places, gobies reappeared as might have been expected, shortly after the end of drought conditions. These recolonizations confirm that the goby's well-established pattern of local extinction and reappearance still exists.