CONSERVATION AGREEMENT

AND

CONSERVATION STRATEGY

for

COLUMBIA SPOTTED FROGS (*RANA LUTEIVENTRIS*)
IN NEVADA

February 2015

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FOR COLUMBIA SPOTTED FROGS IN NEVADA

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GLOSSARY OF TERMS

Adaptive management: Adaptive management is designed to bring new information immediately into management decisions. The effectiveness of all conservation measures and monitoring methods will be periodically reviewed and evaluated by the implementing cooperators through the Columbia Spotted Frog Technical Team (CSFTT). Based on such evaluation, appropriate modifications to methods, actions, and strategies will be made to ensure scientific rigor and the efficacy of conservation measures.

Candidate species: Those species for which the U. S. Fish and Wildlife Service (USFWS) has sufficient information on file on the biological vulnerability and threats to support issuance of a proposed rule to list, but issuance of the proposed rule is precluded by higher listing priorities.

Co-lead responsibility: Participant and signatory to the Conservation Agreement and Strategy (CAS) with shared responsibility with one or more other participants to ensure an identified conservation action or activity will be implemented.

Connectivity: Pathways across and through aquatic or terrestrial blocks of habitat which facilitate and maintain the interchange of individual animals among sub-populations.

Conservation action: An action taken to conserve or preserve natural resources.

Conservation unit: A group of *population units* that either exhibit connectivity or are not separated by known barriers. Connectivity can be by perennial or intermittent flowing water or by landscape features that permit dispersal.

Disease: Pathogenic infection of an organism from an external source which may have a chronic or acute negative effect on that organism at an individual or population level.

Distinct population segment: A *population unit* that can be defined as geographically and/or genetically discrete and significant to the species as a whole for the purpose of listing consideration under the Endangered Species Act.

Fragmentation: The disruption of extensive habitats into isolated and/or small patches.

Historic range: An area inhabited by Columbia spotted frogs at the time of modern exploration and settlement as verified by museum voucher.

Inventory: The process of conducting surveys to determine the total distribution and abundance.

Lead responsibility: Participant and signatory to the Conservation Agreement and Strategy (CAS) with primary responsibility to ensure an identified conservation action or activity will be implemented.

Lentic: Standing water habitats, including natural and beaver ponds, wetlands, and impoundments.

Lotic: Flowing water habitats such as streams and rivers.

Metapopulation: A *conservation unit* in which metapopulation characteristics, such as a source/sink relationship, have been demonstrated to occur, or *population units* that are interconnected within the same drainage systems and are interdependent.

Monitoring: Study of the abundance of individuals in one or more populations of a species at a site through time.

Native: A species that historically occurred in a specific area or habitat.

Non-native: A species that historically did not occur in a specific area or habitat and that now inhabits as a result of human actions. Also known as an exotic species.

Occupied habitat: Areas of habitat where the presence of Columbia spotted frogs has been documented within the past 1 to 10 years, recognizing that year-to-year occurrence can be highly variable and dependent upon metapopulation dynamics and other factors.

Participant/cooperator: Any entity which assists in the development and implementation of conservation actions, whether or not a signatory to the Conservation Agreement and Strategy (CAS).

Potential habitat: Areas which contain one or more key elements of Columbia spotted frog habitat, or areas of unoccupied habitat (both surveyed and unsurveyed) where Columbia spotted frog key elements could be restored.

Population: A particular species in a particular group or in a definable place (*e.g.*, the Great Basin *population* of Columbia spotted frogs).

Population unit: A local population of randomly breeding individuals. A population unit typically occupies a single breeding site, such as a single or a small group of ponds.

Predation: The capture and consumption of one animal by another; applies to all life stages of the organism.

Protocol: A procedure for monitoring or other activity which conforms to standard biological practices and has been identified by the Columbia Spotted Frog Technical Team (CSFTT) as an accepted standardized methodology for conducting that activity.

Relict: A persistent remnant of an otherwise extinct (locally or globally) organism.

Restoration: Specific actions taken to improve or restore habitat or associated ecosystems to potential natural conditions.

Sentinel site: Specific location for defined, periodic monitoring of animals or habitat which provides benchmark data for assessing changes in status or condition.

Sink: A habitat in which local mortality within a population exceeds local reproductive success.

Sink population: A population which has a local mortality that exceeds local reproductive success thus is unsustainable without immigrants from outside sources.

Source: A habitat in which local reproductive success within a population exceeds local mortality.

Source population: An actively breeding population that has an average birth rate that exceeds its average death rate, and thus produces an excess of animals that may disperse to other areas.

Species management plan: Guidance document prepared by one or more participants which identifies detailed actions and activities for conservation of the Columbia spotted frog throughout its range, subject to Adaptive Management review by the Columbia Spotted Frog Technical Team (CSFTT).

Species monitoring plan: Guidance document prepared by one or more participants which defines the structure, timing, protocols, and locations for short- and long-term population monitoring, subject to Adaptive Management review by the Columbia Spotted Frog Technical Team (CSFTT).

Subpopulation: A geographically distinct population segment (*e.g.*, Jarbidge-Independence, Ruby, Toiyabe).

Survey: Field assessment to determine an organism's distribution and abundance in potential habitat.

Threats: Ongoing or potential actions having negative or potential negative impacts to an organism or its habitat.

Viable population: A population that maintains its reproductive vigor and its potential for evolutionary adaptation.

ACKNOWLEDGMENTS

The final Conservation Agreement for the Columbia spotted frog was prepared by the Columbia Spotted Frog Technical Team (CSFTT). Each member of the CSFTT provided valuable information and assistance in development of the document.

Bureau of Land Management: Michael Vermeys, John Wilson

Nevada Department of Wildlife: Brad Bauman, John Elliott, Jeff Petersen, Jon Sjöberg, Teri Slatauski, Brandon Senger

Nevada Natural Heritage Program: Jennifer Newmark, Kristin Szabo

Nye County: Levi Kryder

University of Nevada Cooperative Extension: Kent McAdoo

Natural Resource Conservation Service: Thad Heater

U.S. Fish and Wildlife Service: Chad Mellison

U.S. Forest Service: Jim Harvey, Rachel Van Horne

Numerous other individuals contributed invaluable assistance, personal and technical knowledge, and expertise in development of the conservation strategy and documents.

CONSERVATION AGREEMENT
FOR COLUMBIA SPOTTED FROGS IN NEVADA

PURPOSE

This Conservation Agreement (Agreement) has been developed to assist in the implementation of conservation measures for Columbia spotted frogs (*Rana luteiventris*) in Nevada, as a collaborative and cooperative effort among resource agencies, governments, and landowners. The desired outcome is to ensure the long-term conservation of the Columbia spotted frog within its historical range and to contribute to development of statewide conservation efforts for this species. The parties to this Agreement believe that implementing the conservation measures herein defined will benefit the Columbia spotted frog and should reduce the likelihood for its listing under the Endangered Species Act of 1973, as amended (ESA). Addressing species conservation needs and significantly reducing or eliminating threats that could lead to the federal listing of the Columbia spotted frog should be achieved through full implementation of the Conservation Agreement and Strategy (CAS). This Agreement may provide additional measures to enhance habitats for the Columbia spotted frog that would not be required under the ESA. A pervious ten-year CAS was signed and implemented in 2003.

CONSERVATION GOALS OF THE AGREEMENT

The two primary goals needed to ensure the long-term viability and conservation of the Columbia spotted frog in Nevada are:

Goal 1

To reduce threats to Columbia spotted frogs and their habitat to the extent necessary to prevent populations from becoming extirpated throughout all or a portion of their historical range in Nevada.

Goal 2

To maintain, enhance, and restore a sufficient number of populations of Columbia spotted frogs and their habitat to ensure their continued existence throughout their historical range in Nevada.

These goals will be achieved through implementation of specific measures set forth below and in the Conservation Strategy (Strategy). The status of the Columbia spotted frog will be evaluated annually by the Columbia Spotted Frog Technical Team (CSFTT)—comprised of representatives from the signatory entities to this agreement and other interested parties—through an adaptive management framework to assess program progress.

CONSERVATION OBJECTIVES

The following conservation objectives will be implemented to reach the goals of the CAS stated above. Included with each objective is a statement on how the objective will benefit the Columbia spotted frog and a standard to determine whether the objective was successful at achieving the goal. The conservation actions and commitments by the Cooperators as described in the CAS will be implemented as proposed in the Strategy.

Objective 1. Determine the overall distribution of Columbia spotted frogs in Nevada. (Goal 2)

Benefit: Establish a baseline for the range and habitat conditions in which Columbia spotted frogs exist.

Success Standard: Completed inventories of all known and historical sites using standard protocols and data entered into a centralized database. Inventories will be documented in annual reports.

Objective 2. Assess the abundance of Columbia spotted frogs, habitat conditions, and existing and potential threats at occupied sites. (Goal 1 & Goal 2)

Benefit: Enable biologists and managers to identify changes in Columbia spotted frog populations and implement appropriate management to reverse declines in Columbia spotted frog numbers and correlate habitat degradation with declining Columbia spotted frog populations.

Success Standard: Review and revise as necessary, then implement the Columbia Spotted Frog Monitoring Plan which incorporates a long-term population monitoring program for the purpose of establishing a population baseline and initial population trends within the known range in Nevada. Surveys are conducted annually and on a long-term basis. Identify the range of habitat conditions which are optimum to allow Columbia spotted frog persistence. Monitoring and assessment activities are documented in annual reports.

Objective 3. Ensure that viable populations and their habitats are managed and/or enhanced to ensure the continued existence of Columbia spotted frogs throughout their historical range. (Goal 2)

Benefit: Long-term persistence and viability of Columbia spotted frog metapopulations and suitable habitat across the range of the Columbia spotted frog.

Success Standard: Maintain appropriate level of legal protection. Enforce public land management regulations and policies. Implement a Columbia Spotted Frog Species Management Plan. Implement identified strategies and modify them as needed based on new information using adaptive management. Validate threats and implement strategies to reduce or

eliminate their effects. Maintain source populations and key occupied habitats. Restore habitat conditions to establish new Columbia spotted frog populations and encourage connectivity.

Objective 4. Conduct research that directly supports conservation and management of Columbia spotted frogs and their habitat. (Goal 2)

Benefit: Provide information on basic ecology, threats, and evaluation of management practices needed for adaptive management.

Success Standard: Maintain an active research program focused on needs identified by the CSFTT and ensure findings are evaluated and applied to management strategies. Research findings and their applications are documented in annual reports.

Objective 5. Implement the CAS through administrative procedures and incorporate provisions of the Strategy into agency planning documents and budgets to ensure the goals are met in a consistent manner. (Goal 2)

Benefit: Ensure consistent implementation and funding of CAS actions and activities according to an established timeline. Prioritize Columbia spotted frog conservation actions into land use planning and land use decisions.

Success Standard: Ensure that land use plans are consistent with CAS actions. Funding is consistently allocated toward Columbia spotted frog conservation actions. Cooperators are actively participating in administrative requirements of the CAS.

Objective 6. Develop and implement an adaptive management framework partnership. (Goal 2)

Benefit: Provide focused management and the basis for adaptive management by periodically assessing the effectiveness of conservation actions. Modify strategies and actions as necessary to achieve the conservation goals and objectives of the CAS.

Success Standard: Cooperators are involved in conservation efforts pursuant to the CAS. The CSFTT is meeting semiannually as defined in the Agreement to provide management and conservation recommendations through the adaptive management process. Adaptive management implementation will be documented annually. CAS progress will be documented through annual action plans and reports.

Objective 7. Support the CAS by increasing public awareness and appreciation for Columbia spotted frogs and their habitat, and by making data and information available to interested parties and decision makers. (Goal 2)

Benefit: Enhanced public awareness and appreciation may increase conservation of Columbia spotted frogs and habitats on public and private lands. A central data repository will enable

cooperators to have access to the same information and will benefit the coordination of research and conservation efforts.

Success Standard: Cooperators implement and maintain information delivery on the Columbia spotted frog as identified in the strategy to landowners and the general public. Cooperators implement and maintain an active program to encourage volunteer public and private land conservation efforts. A central data repository is established and maintained for the life of the program. Management and conservation of Columbia spotted frogs is coordinated with actions for other sensitive and resident wildlife species.

OTHER SPECIES INVOLVED

The primary focus of this Agreement is the conservation and enhancement of the Columbia spotted frog and the ecosystems upon which it depends. The needs of listed species and other species of concern, as well as common species that are native to the area, will be considered in planning and designing management actions to benefit the Columbia spotted frog.

SIGNATORY PARTIES

Bureau of Land Management (BLM), 1340 Financial Boulevard, Reno, Nevada

Nevada Department of Wildlife (NDOW), 1100 Valley Road, Reno, Nevada

Nevada Natural Heritage Program (NNHP), 901 South Stewart Street, Suite 5002, Carson City, Nevada

Nye County, 101 Radar Road, P.O. Box 153, Tonopah, Nevada

University of Nevada Cooperative Extension (UNCE), 701 Walnut St., Elko, Nevada

Natural Resource Conservation Service (NRCS), 1365 Corporate Boulevard, Reno, Nevada

U.S. Fish and Wildlife Service (USFWS), 1340 Financial Boulevard, Suite 234, Reno, Nevada

U.S. Forest Service (USFS), 1200 Franklin Way, Sparks, Nevada

Separate Agreements will be developed with additional parties as necessary to ensure implementation of specific conservation measures. The Nevada Department of Wildlife (NDOW) holds regulatory authority for management of Columbia spotted frogs in Nevada as resident wildlife. The U.S. Forest Service (USFS) and Bureau of Land Management (BLM) will maintain their lead federal management roles in the implementation of habitat conservation and restoration activities for Columbia spotted frogs on public lands. The CSFTT will cooperate and coordinate with other states and with other Columbia spotted frog conservation efforts in Nevada as needed in the implementation of this Agreement.

AUTHORITIES

The signatory parties hereto enter into this Agreement under federal and state laws as applicable, including but not limited to, section 6(c)(1) of the ESA, and sections 503.351 and 503.584 of Nevada Revised Statutes (NRS). This Agreement is subject to and is intended to be consistent with all applicable federal and state laws.

Section 6 of the ESA provides encouragement to the states and other interested parties, through federal financial assistance and a system of incentives, to develop and maintain conservation programs which meet national and international standards. This is a key to meeting the United States' international commitments and to better safeguard, for the benefit of all citizens, the nation's heritage in wildlife and plants.

NRS 501.351 provides authority for the Administrator of NDOW to enter into cooperative agreements for the purpose of the management of native wildlife. NRS 503.584 recognizes the state's obligation to conserve and protect imperiled native species. Nevada Administrative Code (NAC) 503.075 extends protected wildlife status to certain native amphibians, including the Columbia spotted frog.

Nevada BLM sensitive species are designated by the BLM Nevada State Director and are protected by the policy described for candidate species as a minimum. The BLM shall carry out management, consistent with the principles of multiple use, for the conservation of candidate species and their habitats and shall ensure that actions authorized, funded, or carried out do not contribute to the need to list any of the species as threatened or endangered (BLM Manual section 6840.06 C).

Under U.S. Department of Interior Secretarial Order 3206 (DOI 1997), the USFWS shall coordinate with affected Indian tribes in order to fulfill trust responsibilities and encourage meaningful tribal participation in the conservation of candidate species under the ESA by: (1) soliciting and utilizing the expertise of affected Indian tribes when designing and implementing candidate conservation actions to remove or alleviate threats so that the species' listing priority is reduced or listing as endangered or threatened is rendered unnecessary; and (2) providing technical advice and information to support tribal efforts and facilitating voluntary tribal participation in implementation measures to conserve candidate species on Indian lands.

The National Forest Management Act requires the Secretary of Agriculture to specify guidelines for land management plans developed to achieve the goals which provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives [16 USC 1604 (g)(3)(B)].

The Natural Resources Conservation Service (NRCS) delivers financial and technical assistance to private landowners in compliance with guidelines specified by the Secretary of Agriculture, Farm Bill legislation, and the Food Security Act. Conservation technical assistance is available independent of receiving financial assistance. Receiving NRCS financial assistance for

conservation is dependent upon Farm Bill funding and eligibility criteria. Private landowners voluntarily working with NRCS in order to receive financial assistance in addressing conservation resource concerns must meet the Farm Bill eligibility criteria and agree to fulfill the necessary requirements.

The Food Security Act (FSA) of 1985 (P.L. 99-198) provides for the conservation, protection, and restoration of air, soil, water, and wildlife resources in compliance with state and federal laws. Subsequent federal Farm Bills under the FSA provide funding and define the programs that will be utilized by NRCS to meet the conservation objectives. NRCS utilizes the authorized Farm Bill programs to provide private landowners both the financial and technical assistance necessary to address conservation resource concerns which benefit, enhance, protect, and restore critical fish and wildlife habitat. This assistance is available to private landowners who voluntarily comply with the Farm Bill requirements and applicable laws with the full understanding that this participation information is protected under the Privacy Act of 1974 (P.L. 93-579) and the privacy protections of Farm Bill legislation. The Privacy Act prohibits the disclosure of information from a system of records by any means of communication to any person, or to another agency absent the written consent of the subject individual or business entity. This signature is necessary for NRCS in complying with the law in order to fulfill the required NEPA process and any necessary consultation as part of providing federal funds.

Nye County has developed land-use and planning procedures under Nye County Ordinance No. 259 (October 15, 2002) as authorized by NRS 548. Nye County has additional authority under NRS 346 to establish and control areas for preservation of listed wildlife and to encourage in any other manner the preservation of those species or subspecies of wildlife in the county likely to have a significant impact upon the economy and lifestyles of the residents of the county if listed as endangered or threatened. The Board of County Commissioners may impose development fees, purchase, sell, exchange, or lease real property or other interests in such properties, or take other actions as authorized by regulation to fulfill these authorities. Nye County exercises these authorities to complement the actions and activities included in the CAS and is participating consistent with its authority as cited. In conducting a review of the status of any species, the Secretary of Interior is required to take into consideration efforts by any state or foreign nation or any political subdivision of a state to protect such species (16 USC 1533 (b)(1)(a)).

This Agreement is subject to and is intended to be consistent with all applicable federal and state laws and interstate compacts.

REQUIRED CONSERVATION TASKS AND RESPONSIBILITIES BY COOPERATOR

To meet the goals of this Agreement, the parties agree to undertake specific conservation actions, as described in the Strategy. Lead and co-lead responsibilities for specific tasks are identified by agency. Where responsibility for undertaking a specific action has not yet been assigned, the parties agree to determine appropriate actions to implement through modifications to the Strategy based on outcomes of reviews as proposed in the Agreement.

CONSERVATION SCHEDULE AND ASSESSMENT

The coordination, implementation, and funding of conservation activities, and progress review, will be conducted as follows:

Coordinating Conservation Activities

- Administration of the Agreement will be conducted by the CSFTT. The CSFTT will consist of a designated representative from signatories to the Agreement and may include technical and legal advisors and other members as deemed necessary by the signatories.

- To facilitate management, the designated leader of the CSFTT for the Toiyabe population of Columbia spotted frogs is the Nye County Natural Resources Manager. The designated leader of the CSFTT for populations of Columbia spotted frogs in northeastern Nevada is the Extension Natural Resources Specialist, University of Nevada Cooperative Extension, Elko, Nevada.

- The CSFTT will meet at least twice annually to review progress in implementing conservation actions, develop conservation schedules, implement adaptive management, and review budgets.

- The CSFTT will revise the Strategy as needed and upon agreement of all parties.

- The CSFTT meetings will be open to interested parties. Meeting minutes and progress reports will be distributed to all CSFTT members, technical advisors, and other interested parties, upon request. The duties for taking and developing meeting minutes and developing progress reports will be rotated amongst team members or on a volunteer basis by any team member.

- The CSFTT will provide annual and five-year reports on conservation status and accomplishments under the Agreement, and will review and revise the Strategy on at least a five-year cycle. The duties for developing annual and five-year progress reports will be rotated amongst team members or on a volunteer basis by any team member.

Implementing Conservation Activities

- A total of 10 years is anticipated for completion of all actions identified in the Strategy. The timetable for completion of specific actions is identified in Table S-1 in the Strategy. Where no time for completion is stated, the timing of such actions will be determined by the CSFTT. The timing of certain actions may not be determinable at this time or may be dependent on the completion of other identified activities.

- The CSFTT will coordinate and monitor progress in achieving outcomes identified in the Agreement.

Funding Conservation Activities

- Funding for the Agreement will be provided by a variety of sources. Federal, state, and local sources will pursue and secure funding to initiate actions identified in the Strategy.

- In-kind contributions such as personnel, field equipment, and supplies will be provided by participating agencies, partners, and volunteers. In addition, each agency will identify specific tasks, responsibilities, and proposed actions/commitments related to their in-kind contributions as outlined in the Strategy.

- It is understood that all funding commitments made under the Agreement are subject to budget authorization and approval by the appropriate agency or government appropriation.

- An annual progress report and assessment will be completed by the CSFTT using the adaptive management framework and provided to signatories to the Agreement. The assessment will consider the effectiveness of conservation activities in achieving the desired outcome and conservation goals and objectives of the Agreement and whether modifications to the Strategy are needed.

DURATION OF AGREEMENT

The duration of the Agreement is for 10 years following the date of final signatures. The parties involved will review the Strategy and its effectiveness at least annually to determine whether it should be revised. During the last year in which it is valid, the Agreement must be reviewed and either modified, renewed, or terminated. If some portion of the Agreement cannot be carried out, or if cancellation is desired, the party requesting such action must notify in writing the other parties within 45 days of the changed circumstances.

Nothing in the Agreement shall be construed as obligating any party hereto in the expenditure of funds, or for the future payment of money, greater than appropriations authorized by law.

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) COMPLIANCE

The CAS is being developed for planning purposes. Before any federal actions can occur on public lands, a determination must be made whether or not NEPA analysis is required. Certain actions by the state of Nevada are not subject to NEPA analysis, with some exceptions where federal funding is utilized.

FEDERAL AGENCY COMPLIANCE

During the performance of the Agreement, the participants will abide by the terms of Executive Order 11246 on non-discrimination and will not discriminate against any person because of race, color, religion, gender, or national origin.

No member of, or delegate to, Congress or resident Commissioner, shall be admitted to any share or part of the Agreement, or to any benefit that may arise therefrom. Nevertheless, this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

This document was designed to meet the requirements of a conservation agreement as specified in the USFWS policy for the evaluation of the conservation efforts (68 FR 15100, 3/28/2003). These criteria are designed to ensure the certainty that the conservation efforts will be implemented, and that when implemented the conservation efforts will be effective. To ensure Policy for Evaluation of Conservation Efforts (PECE) compliance, USFWS cooperators contributed extensively during the development of the plan by serving on the CSFTT. Additionally, a draft of the CAS was reviewed in 2014 by USFWS.

SIGNATURES

In witness whereof, the parties have caused this Conservation Agreement and Strategy for Columbia Spotted Frogs in Nevada to be executed as of the date of the last signature below:

APPROVED:

Bruce Petersen, State Conservationist,
Natural Resources Conservation Service
Nevada State Office, U.S. Department of
Agriculture

William A. Dunkelberger, Forest
Supervisor, Humboldt-Toiyabe National
Forest, U.S. Department of Agriculture,
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Tony Wasley, Director
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Land Management, Nevada State Office

Jennifer Newmark, Administrator
Nevada Natural Heritage Program

Ted Koch, State Supervisor
U.S. Department of Interior, U.S. Fish and
Wildlife Service, Reno, Nevada

2-17-15
Lorinda Wichman, Chairperson
Nye County Board of Commissioners

Dr. Mark Walker, Dean
University of Nevada Cooperative
Extension, Reno, Nevada

CONSERVATION STRATEGY FOR
COLUMBIA SPOTTED FROGS IN NEVADA

INTRODUCTION

In 1989, the U.S. Fish and Wildlife Service (USFWS) received a petition to list the spotted frog (*Rana pretiosa*) under the Endangered Species Act (ESA). The petition cited various reasons why the species should be listed including: (1) habitat destruction; (2) exotic species; (3) underfunding of both state and federal agencies; (4) politics and conservation; and (5) large water projects such as the Central Utah Project (Utah Nature Study Society 1989). The USFWS prepared a 90-day finding and found the petition presented substantial information that the requested action may be warranted (USFWS 1989). In 1993, the USFWS found that listing the spotted frog as threatened in some portions of its range is warranted but precluded by other higher priority actions (USFWS 1993), thus the spotted frog was designated a candidate for listing. This finding also identified five different Distinct Population Segments (DPSs): (1) the main population (Alaska, British Columbia, Alberta, Wyoming, Montana, northern and central Idaho, eastern Washington, and northeastern Oregon); (2) Great Basin (Nevada, southeastern Oregon, and southwestern Idaho); (3) West Coast (western Washington and Oregon and northern California); (4) Wasatch Front (Utah); and (5) West Desert (Utah) (USFWS 1993).

Since the initial petition, the main population of spotted frogs (removed in 1996), the Wasatch Front (removed in 1998), and the West Desert (removed in 1998) DPSs are no longer considered candidates for listing (USFWS 1996, 1998). In 1997, the USFWS accepted species-specific genetic and geographic differences in spotted frogs based on work by Green *et al*. (1996, 1997) which defined populations in western Washington and Oregon and northeast California (West Coast DPS) as Oregon spotted frogs (*R. pretiosa*) and the remainder of the populations as Columbia spotted frogs (*R. luteiventris*) (USFWS 1997). Therefore, the only DPS of Columbia spotted frogs which has retained its candidate status is the Great Basin DPS. The Great Basin population of Columbia spotted frogs currently has a priority status of 9 and has since 2007. The Great Basin DPS has retained candidacy because the USFWS determined that threats remain that continue to warrant its listing (USFWS 2013).

Other Nevada Columbia spotted frog populations are located in the eastern portion of White Pine County at the Nevada/Utah border and are geographically and genetically associated with the West Desert population in Utah. These frogs were withdrawn from federal candidate status in April 1998 in a decision based upon the reduction and/or elimination of threats to this population and completion of a conservation agreement (UDNR 1998) which represented a 10-year commitment for on-going protection and management. This agreement was renewed in 2006 (UDNR 2006).

PURPOSE

The purpose of this Conservation Strategy (Strategy) is to outline a framework for management actions that will provide for the goal of long-term conservation of the Columbia spotted frog and its habitat in Nevada. This Strategy identifies actions that are necessary to reduce or eliminate threats and provide for the long-term conservation of the Columbia spotted frog in Nevada such that protection under the ESA may not be necessary. This Strategy is not intended to restore connectivity between the Columbia spotted frog subpopulations (NE, Toiyabe) in Nevada.

Conservation of the Columbia spotted frog will require reducing or eliminating threats, improving degraded habitat conditions, and restoring many of the natural functions of associated riparian systems. These habitat protection and restoration efforts will also benefit many other threatened and sensitive species that share these ecosystems (Wildlife Action Plan Team 2012). Columbia spotted frog conservation activities are likely to benefit the drainages associated with Columbia spotted frog habitat by maintaining and improving hydrologic function. Improving hydrologic function will not only benefit Columbia spotted frogs, fish, and other wildlife, but also, over the long term, reduce downstream flooding, enhance ranching and haying operations, and expand recreation opportunities.

DESCRIPTION AND ECOLOGY

The Columbia spotted frog belongs to the anuran family Ranidae. The frogs native to Nevada are the Columbia spotted frog (*Rana luteiventris*), Sierra Nevada yellow-legged frog (*Rana sierrae*; no longer found in Nevada), northern leopard frog (*Lithobates pipiens*), relict leopard frog (*Lithobates onca*), Vegas Valley leopard frog (*Lithobates fisheri*; extinct), and the northern Pacific treefrog (*Pseudacris hypochondriaca*). Two additional frogs have been successfully introduced into Nevada. These are the red-legged frog (*Rana aurora*), native to California, and the bullfrog (*Lithobates catesbeiana*), native east of the Continental Divide.

Ranids typically are characterized as slim-waisted, long-legged, smooth-skinned jumpers with webbed hind feet and usually with a pair of dorsolateral folds (glandular folds) that extend from behind the eyes to the lower back (Figure 1). Adult Columbia spotted frogs measure between 5 and 10 centimeters (cm) [2 and 4 inches (in)] from snout to vent, with females being larger than males (Tait 2007). Dorsal color and pattern include a light brown, dark brown, or gray, with small spots. Ventral coloration can differ among geographic population units and may range from yellow to salmon; however, very young individuals may have very pale, almost white, ventral surfaces. The throat and the ventral region are sometimes mottled. The head may have a dark mask with a light stripe on the upper jaw, and the eyes are turned slightly upward. Adult male frogs have swollen thumbs with darkened bases (Stebbins 2003).

Figure 1: Photographs of Columbia spotted frog (*Rana luteiventris*) depicting dorsolateral folds (glandular folds), dorsal color and pattern, ventral coloration, mottled throat coloration, and swollen thumb of adult male frog.

Columbia spotted frogs are found closely associated with clear, slow-moving, or ponded surface waters with little shade and relatively constant water temperatures (Munger *et al*. 1996, Reaser 1997, Reaser and Pilliod 2005, Welch and MacMahon 2005). Reproducing populations have been found in habitats characterized by springs, floating vegetation, and larger bodies of pooled water (*e.g.*, oxbows, lakes, stock ponds, beaver-created ponds, seeps in wet meadows, backwaters) (Reaser and Pilliod 2005). A deep silt or muck substrate may be required for hibernation and torpor (a state of lowered physiological activity that usually occurs during colder months) (Bull 2005, Reaser and Pilliod 2005). In colder portions of their range, Columbia

spotted frogs will use areas where water does not freeze, such as spring heads and undercut streambanks with overhanging vegetation (Bull 2005, Reaser and Pilliod 2005); however, they can overwinter underneath ice-covered ponds (Bull and Hayes 2002, Tattersall and Ultsch 2008).

Males become sexually mature 1–2 years earlier than females, usually at age 2 or 3 (Reaser and Pilliod 2005). Columbia spotted frogs employ a scramble mating system in which males race for access to females and there is little opportunity for female choice or male combat (Greene and Funk 2009). Breeding occurs once a year in the spring with timing being a factor of latitude, elevation, and annual weather (Reaser and Pilliod 2005). Consecutive year breeding has been documented in females (Bull 2005). Females usually lay egg masses in the warmest areas of a pond, typically in shallow water (10–20 cm, 4–8 in), and clutch sizes vary (150–2,400 eggs) (Bull and Shepherd 2003, Bull 2005, Reaser and Pilliod 2005, Pearl *et al*. 2007a). Eggs generally hatch in 8–21 days depending on water temperature, and tadpoles usually metamorphose by mid to late summer; however, they have been observed in the tadpole stage as late as October (Bull 2005, Reaser and Pilliod 2005). There is no evidence of overwintering in the tadpole stage (Reaser and Pilliod 2005). Successful egg production and the viability and metamorphosis of Columbia spotted frogs are dependent on habitat variables such as temperature, depth, and pH of water; cover; and the presence or absence of predators (Munger *et al*. 1996, Reaser 1997, Bull 2005, Reaser and Pilliod 2005). Once they become adults, male Columbia spotted frogs have lower survival rates than females (Turner 1962). While the oldest frogs documented were 12–13 years old, most males live 3–4 years and females typically survive 5–8 years (Reaser 2000, Bull 2005). Female growth rates are higher than males with sexual dimorphism occurring in frogs at 2 years of age (Bull 2005).

While Columbia spotted frogs can show strong site fidelity, individuals are capable of travelling relatively large distances if adequate habitat is available (Bull 2005, Reaser and Pilliod 2005). Radio telemetry and mark-recapture studies have shown movement of 5 kilometers (km) [3.1 miles (mi)] or more for breeding, overwintering, foraging, or predator avoidance (Reaser 1996, Bull and Hayes 2001, Pilliod *et al*. 2002, Bull 2005, Funk *et al*. 2005, Mellison 2012 unpublished data). Movement usually occurs along shoreline habitat or riparian corridors; however, overland movement has been documented (Pilliod *et al*. 2002, Funk *et al*. 2005).

Adult Columbia spotted frogs feed during the day or night and are opportunistic feeders, consuming many types of insects, mollusks, and even other amphibians (Turner 1959, Miller 1978, Whitaker *et al*. 1983, Bull 2005, Reaser and Pilliod 2005). Bull (2005) conducted a diet analysis on adult Columbia spotted frogs in northeastern Oregon where the most common insects consumed were beetles (21 percent), ants or wasps (21 percent), and flies (10 percent). Tadpoles are grazers which consume algae and detritus (Reaser and Pilliod 2005).

In the Great Basin, Columbia spotted frogs are found in naturally fragmented habitats that are seasonally xeric, resource-limited, and often ephemeral. Such habitats are sensitive to

disturbance, both natural and human-caused (Soulé 1983), thus increasing the chance of stochastic extirpation for its inhabitants (Lande and Barrowclough 1987).

Individual populations of Columbia spotted frogs are vulnerable to extirpation due to their isolation from other population segments (*i.e.*, lack of habitat connectivity), the relatively arid environment they inhabit, and land use patterns that subject their habitat to fragmentation and loss as a consequence of lowered water tables, water diversions, and pond destruction (Reaser 2000). The biogeographic isolation of these populations are likely a consequence of changed conditions under post-pluvial (*i.e.*, after late Pleistocene) hydrologic regimes (Madsen *et al.*, 2002).

SPECIES DISTRIBUTION AND SUBPOPULATIONS

Columbia spotted frogs in Nevada are currently found in the central (Nye County) and northern (Elko, Eureka, and Humboldt county) portions of the state, usually persisting at elevations between 1,700 and 2,650 meters (m) [5,600 and 8,700 feet (ft)], although they have been recorded historically in a broader range (Reaser 2000) . Based upon geography, Columba spotted frogs in Nevada can be grouped further into three well-defined subpopulations: (1) a large subpopulation located across the Jarbidge and Independence Ranges and the Tuscarora Mountains located in the northern portion of Elko County and the northern portion of Eureka County (Jarbidge – Independence subpopulation); (2) an isolated subpopulation located in the Ruby Mountains in the southeastern portion of Elko County (Ruby Mountain subpopulation); and (3) an isolated subpopulation located in the Toiyabe Range in central Nevada in Nye County (Toiyabe Range subpopulation) (Figure 2).

The northeastern Nevada subpopulations, the Jarbidge – Independence and the Ruby Mountains subpopulations, are broken into smaller Management Units to better facilitate species management. Currently, these Management Units are based on fourth level Hydrologic Unit Codes (HUC), which consist of large watersheds, rather than the results of genetic analysis (Figure 3). Because genetic information for the Nevada subpopulations is incomplete, they are currently managed by watershed, although a genetic study is in progress at the time of this writing. Additionally, it is important to note the timeframe used to distinguish between historic and current site records is the year 1993. This time frame was used due to the candidate status of the Columbia spotted frogs, increased attention given to the species by state and federal agencies, and the standardization of survey protocols that soon followed. All site records prior to 1993 will be considered historic and all records for the year 1993 and after will be deemed current (Figure 4).

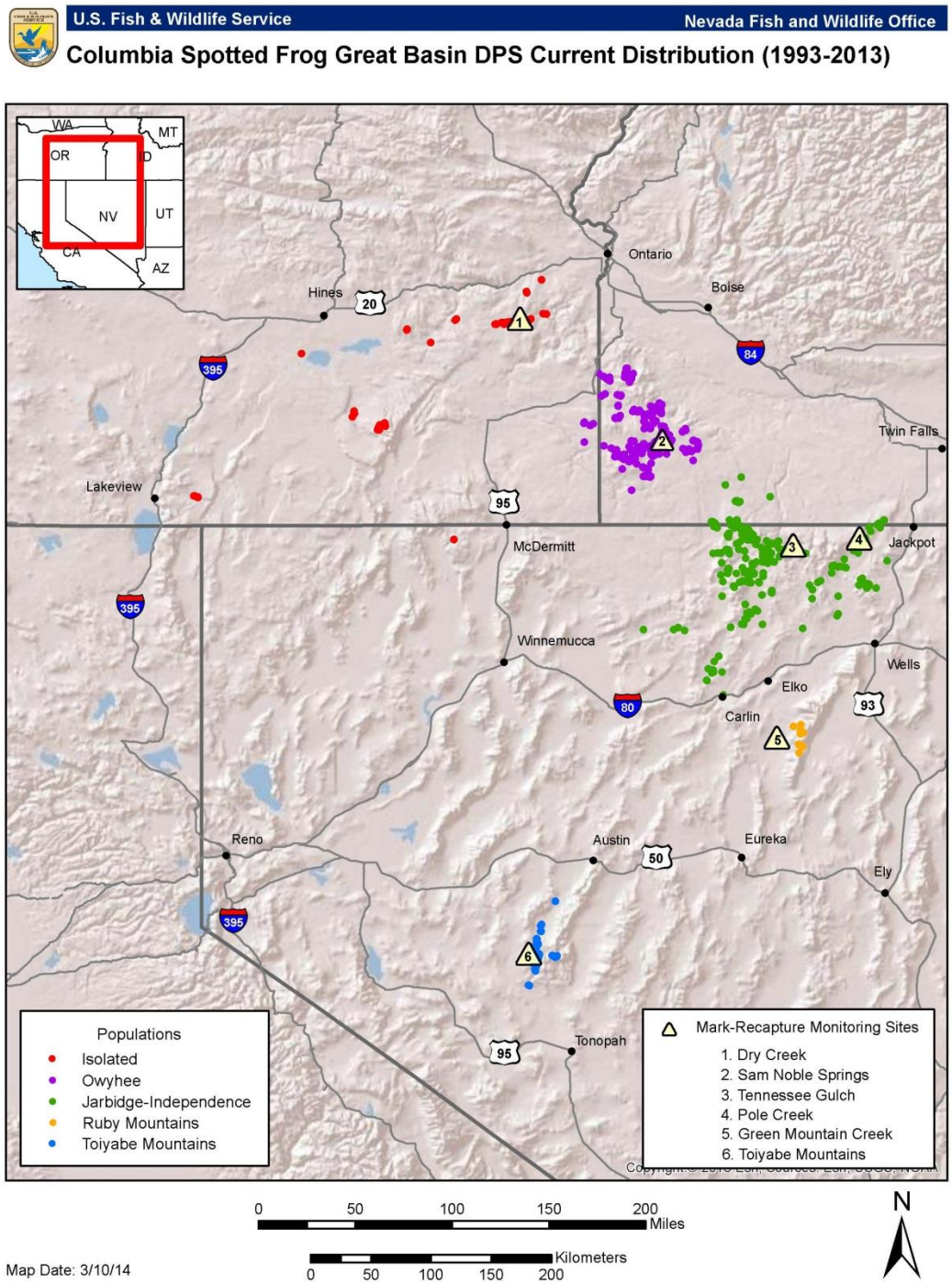

Figure 2. Current distribution of Great Basin Distinct Population Segment of the Columbia spotted frog (*Rana luteiventris*)

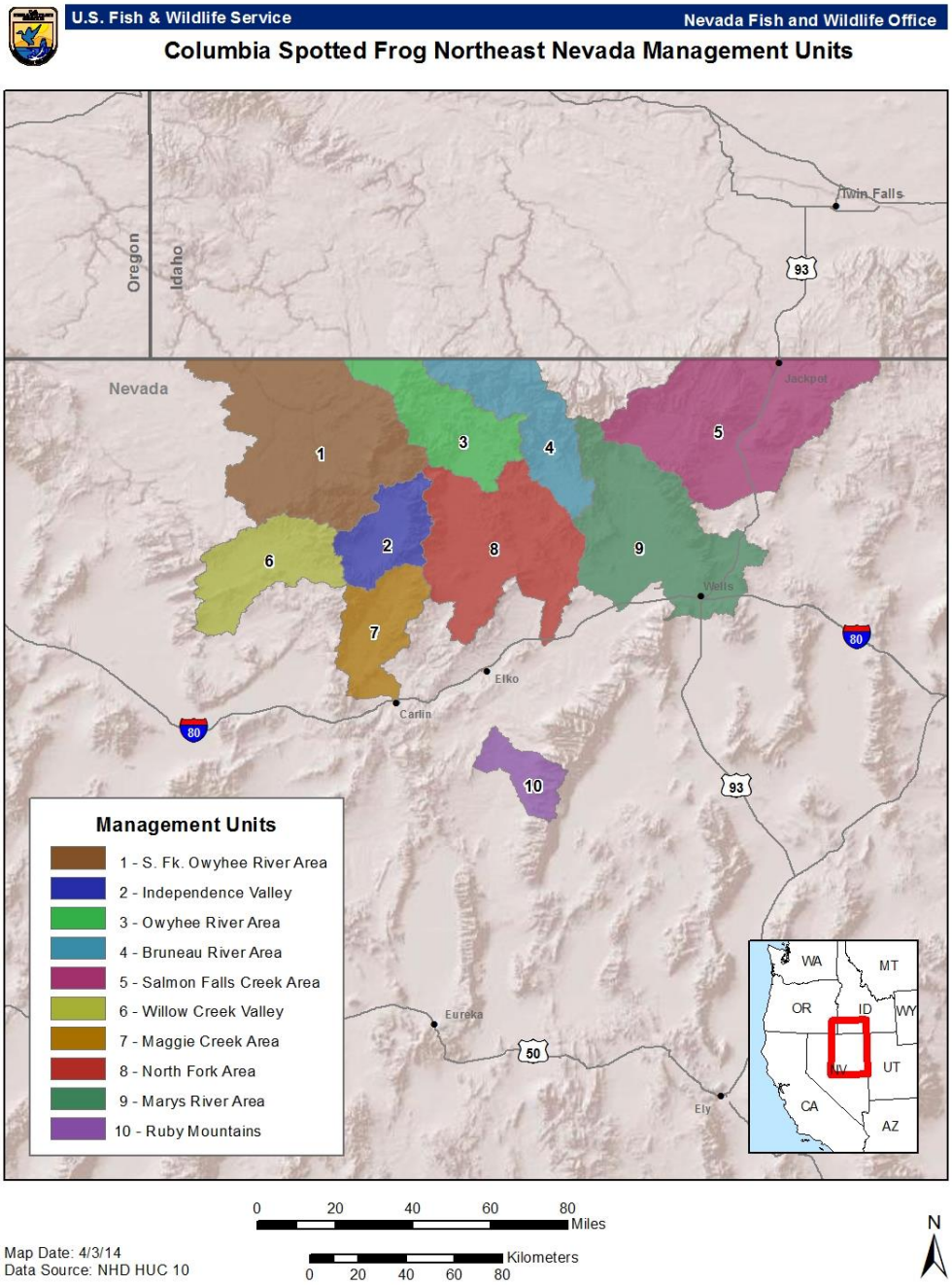

Figure 3. The Jarbidge – Independence and Ruby Mountains subpopulations are broken into smaller Management Units (4th Level HUC) to better facilitate species management, which consist of large watersheds, rather than the results of genetic analysis.

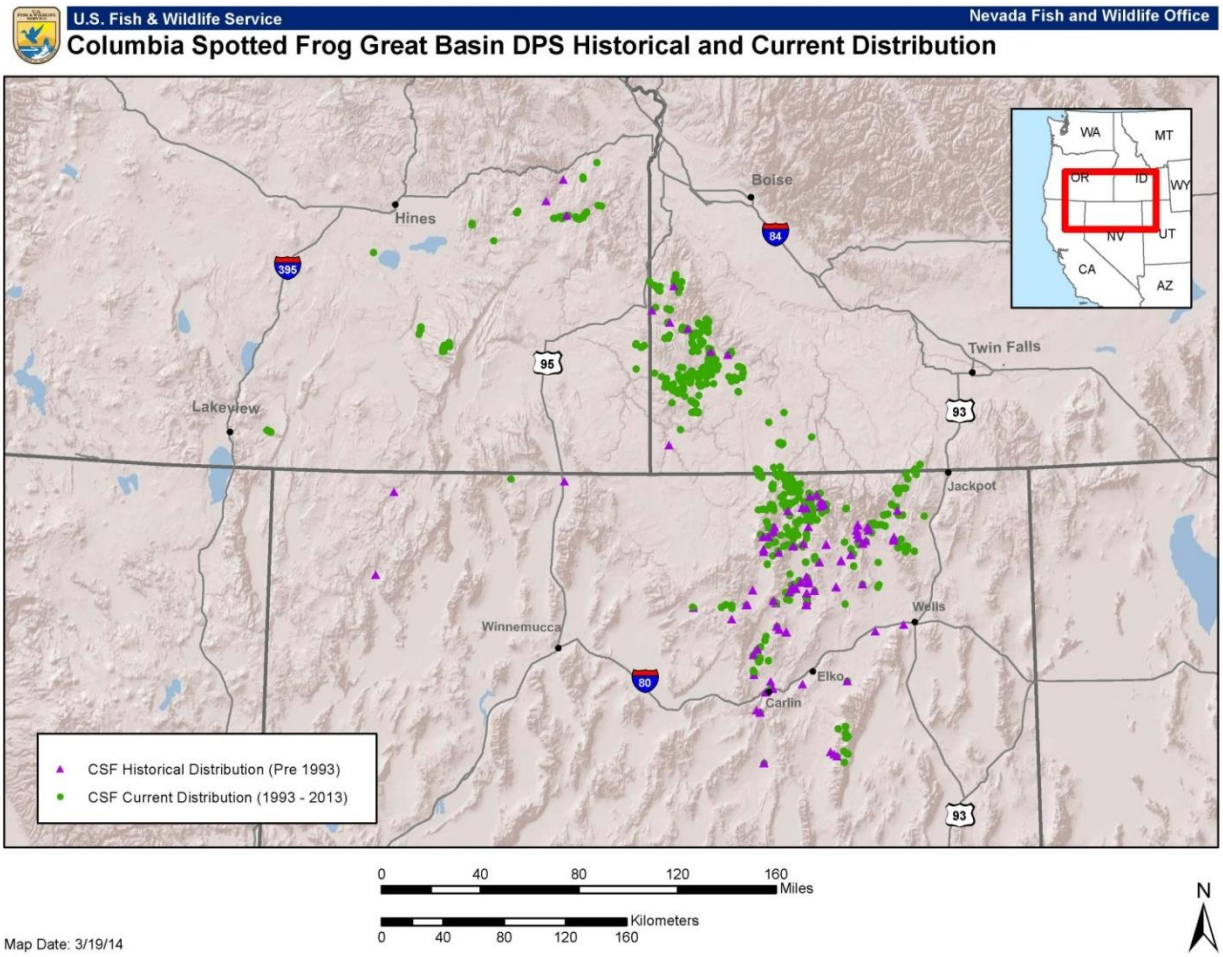

Figure 4. Survey sites of Great Basin populations of Columbia spotted frogs (*Rana luteiventris*) in southeastern Oregon, southwestern Idaho, and northern Nevada showing historic and current distributions.

Jarbidge – Independence Subpopulation

The Jarbidge – Independence subpopulation includes watersheds in both the Humboldt River and Snake River basins, and is the largest of Nevada's three subpopulations in both area and number of population units (Figure 3). The Jarbidge – Independence subpopulation area is dominated by large tracts of National Forest and Bureau of Land Management lands, with the remaining areas consisting of private and tribal lands. Columbia spotted frogs in this area can be found on all land ownership and habitat types, if the habitat is conducive. This subpopulation is currently subdivided into nine management units, which are described below.

Bruneau River Management Unit (Figure 3, number 4)

The Bruneau Management Unit covers approximately 520 square miles and is made up of 23 individual watersheds (6th level HUC). One watershed is considered "dry", as there is no

perennial water associated with it. Of the 22 remaining watersheds that are associated with perennial water, 13 watersheds have been surveyed, resulting in spotted frogs being found in ten of those watersheds.This Management Unit contains two egg mass sentinel sites and one population sentinel site.

Independence Valley Management Unit (Figure 3, number 2)
The Independence Valley Management Unit covers approximately 896 square km (346 square mi) and is made up of 11 individual watersheds (6th level HUC). This management unit and its associated waters are predominately privately owned. All 11 watersheds are associated with perennial water and eight of the watersheds have been surveyed. Of the surveyed watersheds, three are occupied. There are no sentinel sites in this Management Unit.

Maggie Creek Management Unit (Figure 3, number 7)
The Maggie Creek Management Unit covers approximately 1,015 square km (392 square mi) and contains 11 individual watersheds (6th level HUC). All of the watersheds are associated with perennial water and all of these watersheds have been surveyed. The surveyed watersheds have resulted in six watersheds being occupied by spotted frogs and four being considered absent. The unoccupied watersheds did not have suitable habitat. There are no sentinel sites in this Management Unit.

Mary's River Management Unit (Figure 3, number 9)
The Mary's River Management Unit covers approximately 2,784 square km (1,075 square mi) and contains 30 individual watersheds (6th level HUC). Five watersheds are considered "dry," as they are not associated with perennial water. Of the 25 remaining watersheds that are associated with perennial water, 16 watersheds have been surveyed, resulting in five occupied and three unoccupied watersheds. The unoccupied watersheds did not have suitable habitat. There are no sentinel sites in this Management Unit.

North Fork of the Humboldt River Management Unit (Figure 3, number 8)
The North Fork of the Humboldt River Management Unit covers approximately 2,849 square km (1,100 square mi) and contains 31 individual watersheds (6th level HUC). Four watersheds are considered "dry," as they are not associated with perennial water. Of the 27 remaining watersheds that are associated with perennial water, 12 watersheds have been surveyed, resulting in eight occupied and two unoccupied watersheds. The unoccupied watersheds did not have suitable habitat. This Management Unit contains one egg mass sentinel site.

Owyhee River Management Unit (Figure 3, number 3)
The Owyhee River Management Unit covers approximately 1,378 square km (532 square mi) and contains 15 individual watersheds (6th level HUC). One watershed is considered "dry," as it is not associated with perennial water. Of the 14 remaining watersheds that are associated with perennial water, 13 watersheds have been surveyed, resulting in 12 occupied and one watershed with inconclusive survey results. This Management Unit contains two egg mass sentinel sites.

Salmon Falls Management Unit (Figure 3, number 5)
The Salmon Falls Management Unit covers approximately 3,165 square km (1,222 square mi) and contains 37 individual watersheds (6th level HUC). Nine watersheds are considered "dry," as they are not associated with perennial water. Of the 28 remaining watersheds that are associated with perennial water, 16 watersheds have been surveyed, resulting in 9 occupied, two unoccupied watersheds, and 5 watersheds with inconclusive results. This Management Unit contains one egg mass sentinel site and one population sentinel site.

South Fork Owyhee River Management Unit (Figure 3, number 1)
The South Fork Owyhee River Management Unit covers approximately 3,400 square km (1,313 square mi) and contains 38 individual watersheds (6th level HUC). Fourteen watersheds are considered "dry," as they are not associated with perennial water. Of the 24 remaining watersheds that are associated with perennial water, six watersheds have been surveyed, with spotted frogs found in five of these watersheds. This Management Unit contains one egg mass sentinel site.

Rock Creek Management Unit (Figure 3, number 6)
The Rock Creek Management Unit covers approximately 1,054 square km (407 square mi) and contains 11 individual watersheds (6th level HUC), all of which are associated with perennial water. Seven watersheds have been surveyed, with spotted frogs found in two watersheds. One watershed has been deemed unoccupied and three watersheds have inconclusive results. There are no sentinel sites in this Management Unit.

Ruby Mountain Subpopulation
The Ruby Mountains have suitable Columbia spotted frog habitat that is disjunct from other suitable habitats, and thus considered a discrete subpopulation (Figure 3). This subpopulation should be considered significant to the species as a whole because it occupies a unique and unusual ecological setting and its loss would result in a substantial modification of the species' range.

The Ruby Mountain subpopulation occurs in the South Fork of the Humboldt River drainage, which is geographically isolated from the Jarbidge – Independence subpopulation area to the north and from the Toiyabe subpopulation area to the southwest by discontinuity of the Humboldt River. The South Fork of the Humboldt River valley has been extensively developed for irrigated agriculture, reducing stream flows by diversion and resulting in large scale habitat fragmentation. Additionally, non-native bullfrogs have been documented lower in the system and will continue to impact Columbia spotted frog distribution. Preliminary evaluation of recent and historic survey data suggests there is one Management Unit, Ruby Mountain Management Unit. This management unit contains one population unit and three isolated population units (Figure 3).

Ruby Mountain Management Unit (Figure 3, number 10)
The Ruby Mountain Management Unit covers approximately 385 square km (149 square mi) and contains five individual watersheds (6th level HUC), all of which are associated with perennial water. Three watersheds have been surveyed, with Columbia spotted frogs found in all three watersheds. This Management Unit contains one population sentinel site.

Toiyabe Subpopulation
The Toiyabe subpopulation includes watersheds within the Reese River and Southern Big Smoky Valley drainages. These Columbia spotted frogs are geographically isolated from the Ruby Mountain and Jarbidge – Independence Range subpopulations by a large gap in suitable habitat and they represent the southern-most extremity of the species' range (Figure 5). Because the Toiyabe Range and its drainages possess suitable Columbia spotted frog habitat that is disjunct from other suitable habitat, this subpopulation may be considered significant to the species as a whole because it occupies a unique and unusual ecological setting and its loss would result in a substantial modification of the species' range. Approximately 90 percent of Toiyabe subpopulation habitat on public land in this area is managed by the USFS, while the remainder is managed by the BLM (Figure 5). Additional Columbia spotted frog habitat likely occurs within the Yomba Shoshone tribal lands and on private lands.

Reese River Management Unit (Figure 6)
The Reese River Management Unit covers approximately 6,162 square km (2,379 square mi) and contains 48 individual watersheds (6th level HUC). Of the 48 watersheds, 12 have historic or current occurrence of frogs. The habitat in this Management Unit is dominated by beaver activity at higher elevations. At lower elevations, extensive habitat restoration has been completed, creating ponds that provide habitat. This Management Unit contains one egg mass sentinel site and two population sentinel sites. The population sentinel site on Indian Creek in this Management Unit is the largest and most intensive, including 10 transects and covering approximately five miles of stream.

Southern Big Smoky Valley Management Unit (Figure 6)
The Southern Big Smoky Valley Management Unit covers approximately 5,310 square km (2,050 square mi) and contains 28 individual watersheds (6th level HUC). Of the 28 watersheds, only one has historic or current occurrence of frogs. Additional suitable habitat in this watershed is limited and the potential for finding additional site populations is low. This Management Unit contains one egg mass sentinel site and one population sentinel site.

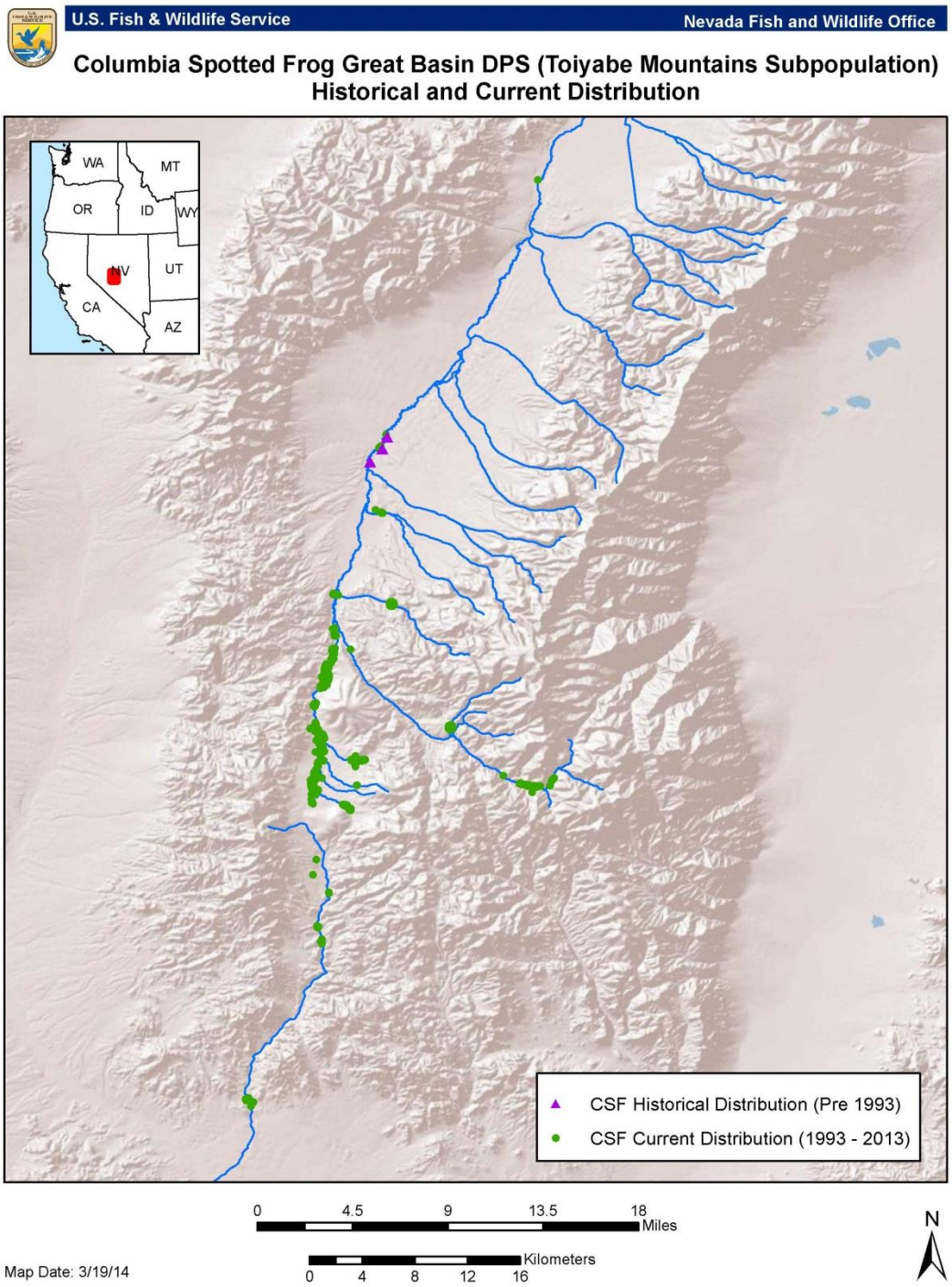

Figure 5. Survey sites of Great Basin populations of Columbia spotted frogs (*Rana luteiventris*) in central Nevada showing historic and current distributions.

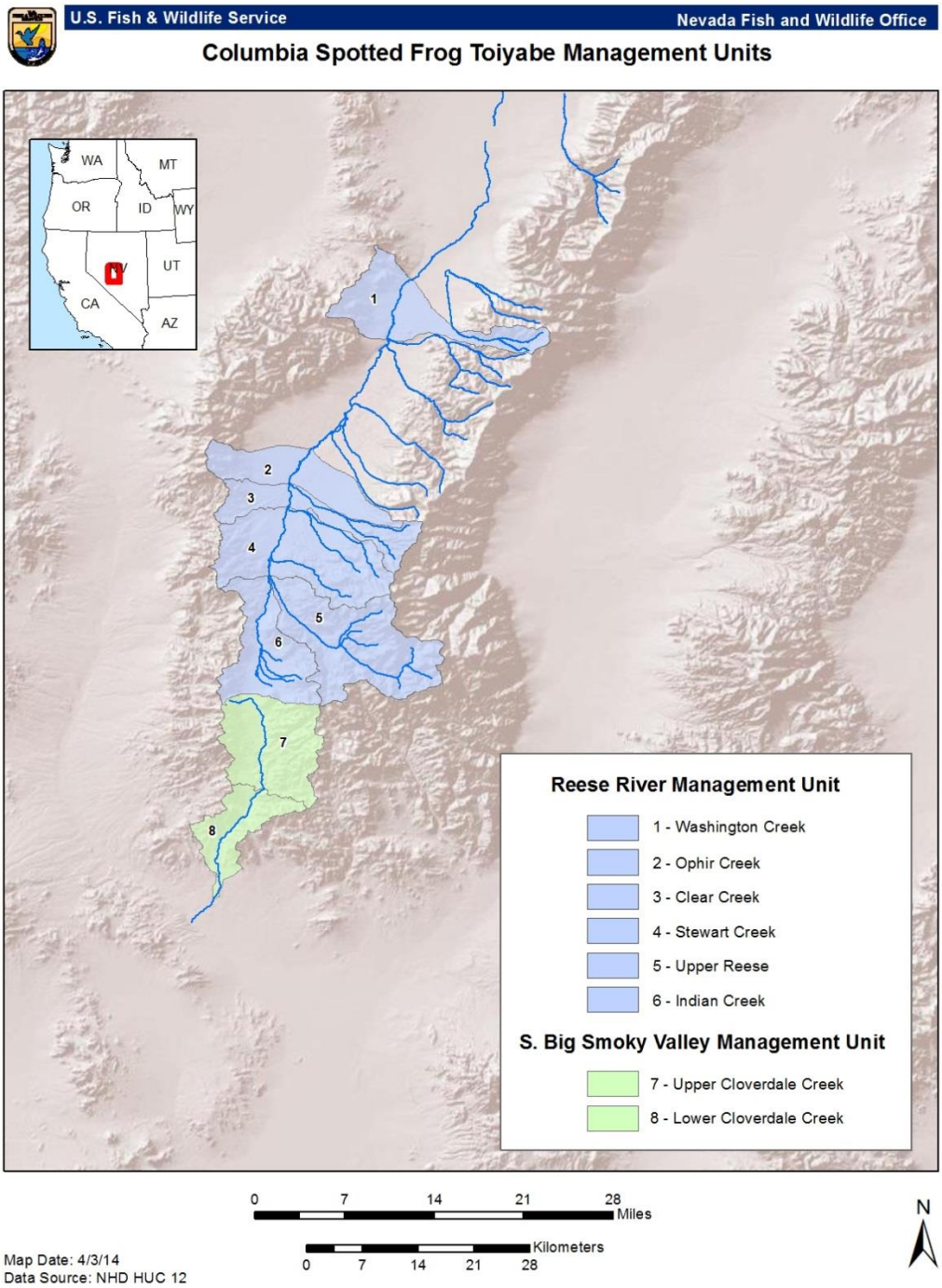

Figure 6. The Toiyabe subpopulation is broken into smaller Management Units (4th Level HUC) to better facilitate species management, which consist of large watersheds, rather than the results of genetic analysis.

McDermitt Subpopulation

In 2013, NDOW found Columbia spotted frogs in Sage Creek, which is a tributary to McDermitt Creek. The McDermitt subpopulation includes the watershed of McDermitt Creek (Figure 7). The McDermitt Creek subpopulation area is comprised of tracts BLM lands with the remaining areas consisting private and tribal lands. Most of the high quality Columbia spotted frog habitat within the McDermitt Creek watershed is on private land. This subpopulation is newly discovered.

Historical Records

There are five site records that are not associated with the aforementioned 10 Drainages: Antelope Creek (1987), Eldridge Ranch (1960), Lamoille Creek (1953), Pine Creek (1938), and Suzie Creek (1976). Antelope Creek has been visited on other projects and no spotted frogs have been documented, although an intensive survey of the entire system is needed to confidently conclude that the system is no longer occupied. The remaining four sites have not been surveyed, partially due to their occurrence on private property. As access becomes available, these surveys can be conducted to evaluate the persistence of spotted frogs at these sites, which have been impacted for many years by agricultural practices and the establishment of non-natives, such as bullfrogs.

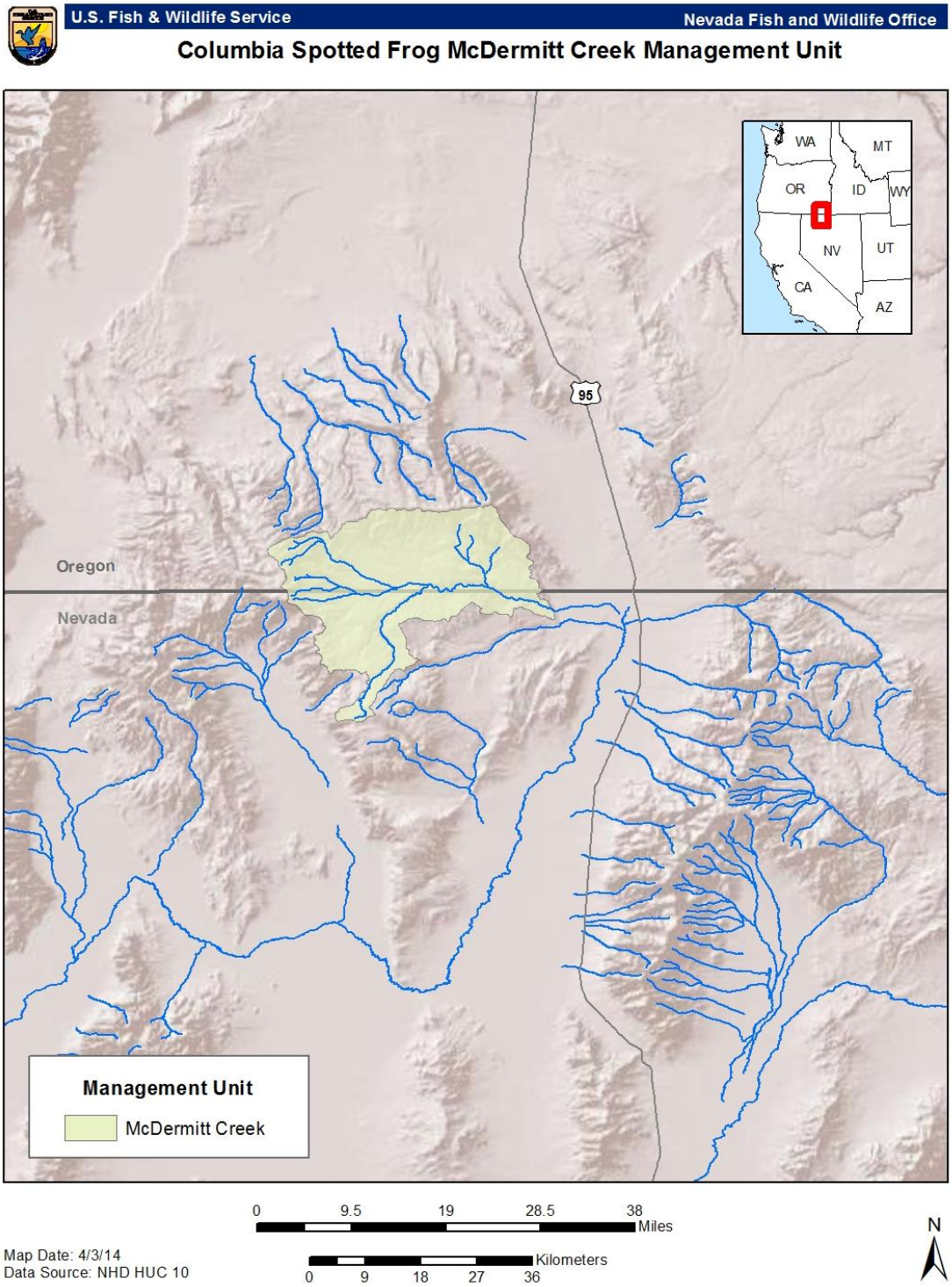

Figure 7. The McDermitt Management Unit in which Columbia spotted frogs were discovered in 2013.

POTENTIAL THREATS TO THE CONTINUED EXISTENCE OF COLUMBIA SPOTTED FROGS IN NEVADA

The success of any conservation or recovery program depends on reducing or eliminating the threats to the species' existence. The following list of potential threats to the Columbia spotted frog is based on the five federal listing factors in Section 4(a)(1) of the ESA. For each of these factors, specific activities potentially threatening the persistence of Columbia spotted frog populations are described.

Factor 1. Habitat Degradation: The present or threatened destruction, modification, or curtailment of Columbia spotted frog habitat or range.

Water Diversions: Water diversions may be a significant threat to Columbia spotted frogs due to the removal of water from streams or wetlands for activities associated with livestock grazing and agriculture, particularly where drainages terminate and water becomes a limiting factor. Because of appropriations under state of Nevada water law and land use practices on public, private, and tribal lands, water diversions continue to occur and may be problematic for Columbia spotted frog conservation and recovery in some locations, particularly at lower elevations (Reaser 1997, USFWS 1993).

Livestock Grazing: Livestock grazing occurs throughout the range of Columbia spotted frogs and heavy utilization from livestock has been cited as detrimental to Columbia spotted frog habitat (Munger *et al*. 1996, Reaser 1997, Engle 2002, USFWS 2006). Though direct effects of livestock grazing on Columbia spotted frog distribution and populations are not well documented, the effects of heavy grazing on riparian areas are well documented (Kauffman *et al*. 1983a, 1983b, Kauffman and Kreuger 1984, Schulz and Leininger 1990, Belsky *et al*. 1999).

Bull and Hayes (2000) found no impacts of cattle grazing on the reproductive success of Columbia spotted frogs in ponds in northeastern Oregon; however, there was high variability in their results and grazing intensity and timing was not evaluated. Adams *et al*. (2009) found no significant short-term effects of cattle exclosures on the number of Columbia spotted frog egg masses, larval survival, size of metamorphs, or water quality measurements. Moreover, nutrient levels often associated with negative impacts to amphibians were very low to non-detectable (Adams *et al*. 2009). In contrast, Gray *et al*. (2007) found higher levels of *Ranavirus* (an emerging pathogen implicated in many amphibian declines) in green frogs (*Lithobates clamitans*) within ponds accessed by cattle. They suspected that poor water quality (a stressor) and minimal vegetation (which increases contact rates among individuals) in cattle-access ponds played a role. Howard and Munger (2003) found lower survival of Columbia spotted frog larvae in their high livestock waste treatment; however, the high waste treatment

larvae that survived had higher growth rates. Schmutzer *et al*. (2008) found significantly larger green frog, bullfrog, and pickerel frog (*L. palustris*) larvae in ponds with cattle grazing; however, larval abundance for all three species was significantly higher in ponds with no cattle grazing. Additionally, water quality measurements including turbidity, specific conductivity, and dissolved oxygen, were significantly higher in ponds with grazing (Schmutzer *et al*. 2008). Recent studies have reported that changes in the timing and duration of livestock grazing, and incorporating rest-rotation grazing strategies, result in improved riparian habitat conditions and water quality in occupied Columbia spotted frog habitat in northern Nevada (Booth *et al*. 2012, Dalldorf *et al*. 2013, Kozlowski *et al*. 2013). While livestock grazing occurs in nearly all populations, the status of Columbia spotted frog habitat as it relates to livestock use is unknown.

Spring Development: Springs provide a permanent source of water for breeding, feeding, and winter refugia. Springs serve as essential hibernacula by providing deep, protected areas for Columbia spotted frogs in cold climates. Some springs have been modified for livestock use or for diversion of water for irrigation, rendering the springs unavailable to Columbia spotted frog use. The loss of spring habitats such as hibernacula, feeding or breeding sites, or just wet spots in dry years, may be a threat to Columbia spotted frogs (Munger *et al.* 1996, Sada and Vinyard 2002).

Roads and Culverts: Construction of roads and culverts can pose a threat to amphibians by fragmenting habitat and creating barriers that prevent or curtail frog movement from one portion of their habitat to another (Reh 1989). Within the range of Columbia spotted frog, the extent to which roads and culverts fragment habitat and create movement barriers is unknown; however, it is thought to be of limited occurrence.

Beaver Management: Widespread removal of beaver from trapping throughout the Great Basin in the 19th and 20th centuries (Clements 1991) likely impacted and contributed to Columbia spotted frog habitat fragmentation. The reduction of beaver populations has been noted as an important feature in the reduction of suitable habitat for Columbia spotted frogs (Reaser 1997, Wildlife Action Plan Team 2012). Throughout North America, beaver populations have rebounded as the result of harvest restrictions and re-introductions (Clements 1991, Gibson and Olden 2014). Similarly, beaver populations in Nevada have recovered dramatically since near extirpation during the fur trapping era of the early19th century. The Nevada beaver population in 2013-2014 was estimated to be 71,000, with sustained harvests over the last 40 years averaging 914 beavers annually (Espinosa and Woolstenhume 2014). Gruell and Swanson (2012) commented that beaver numbers in northern Nevada have increased significantly since the late 19th century, with animals moving to headwater streams in response to changing habitat conditions, to the point that by the 1940s, the State employed a full-time beaver trapper to handle the numerous depredation complaints. Riparian conditions on many northern Nevada streams have improved as the result of rotational livestock grazing and reduced grazing duration during the growing season (Dalldorf et al. 2013). Beavers have apparently responded favorably to these improving riparian conditions that include increased availability of aspen and willows (Gruell

and Swanson 2012). The presence of beaver in central Nevada streams before Euro-American exploration and settlement has been questioned (Hall 1946, Jenkins and Busher 1979, Gibson and Olden 2014). However, whether or not they were present during this historic period, beaver were unaccounted for in the Toiyabe Mountains during an intensive 4-year survey from 1930-1933 (Linsdale 1938). Twentieth century beaver management has resulted in contemporary thriving populations in the Toiyabe Mountains and other areas of central Nevada, as evidenced by the need for occasional depredation-based control by Nevada Department of Wildlife.

Beaver are important in the creation of small pools with slow-moving water that function as habitat for frog reproduction and create wet meadows that provide foraging habitat and protective vegetation cover (Naiman *et al*. 1988, Amish 2006, Cunningham *et al*. 2007, Stevens *et al*. 2007). In northeastern Nevada, 57 percent of known occupied sites are associated with beaver ponds (J. Petersen 2013, pers. comm.). There is a growing body of evidence linking the positive habitat influence of beaver to the presence of Columbia spotted frogs in Nevada.

Factor 2. Overutilization: Overutilization for commercial, recreational, scientific, or educational purposes.

Collection: Over-exploitation of amphibians for commercial markets is known for many species (Jennings and Hayes 1984). However, collection of Columbia spotted frogs in Nevada, other than controlled and low-level sampling for scientific purposes, is not currently known to occur.

Factor 3. Disease and Predation: Disease, predation, competition, and hybridization.

Disease: Although a diversity of microbial species is naturally associated with amphibians, it is generally accepted that they are rarely pathogenic to amphibians except under stressful environmental conditions. Amphibian chytridiomycosis (chytrid), caused by the pathogenic fungus *Batrachochytrium dendrobatidis* (*Bd*), is an emerging panzootic fungal disease that has been associated with amphibian declines in the United States and globally (Daszak *et al*. 2003, Blaustein *et al*. 2005, Briggs *et al*. 2005, Ouellet *et al*. 2005, Rachowicz *et al*. 2006, Pounds *et al*. 2006, Pearl *et al*. 2007b, Vredenburg and Wake 2007). Clinical signs and diagnosis of amphibian chytrid are described by Daszak *et al*. (1999) and include abnormal posture, lethargy, and loss of righting reflex. Gross lesions, which are usually not apparent, consist of abnormal epidermal sloughing and ulceration; hemorrhages in the skin, muscle, or eye; hyperemia of digital and ventrum skin; and congestion of viscera. Diagnosis is by identification of characteristic intracellular flask-shaped sporangia and septate thalli within the epidermis. Chytrid can be identified in some species of frogs by examining the oral discs of tadpoles which may be abnormally formed or lacking pigment (Fellers *et al*. 2001).

Columbia spotted frogs at sites in Alberta, Canada, northeastern Oregon, and northern Idaho (Northern DPS) have tested positive for *Bd* (Bull 2006, Engle 2006, Pearl *et al*. 2007b, Adams *et al*. 2010, Russell *et al*. 2010, Stevens *et al*. 2012). *Bd* has recently been detected at the

Tennessee Gulch site within the Bruneau River watershed in northeastern Nevada (Hanson and Glenn 2011). In addition, *Bd* has been found in two bullfrog populations within Nevada. Along the Owyhee River in northern Elko County, one population of Columbia spotted frogs (which has not been tested) co-occurs with infected bullfrogs (Green 2006); the other infected bullfrog population is near Beatty, Nevada, which is approximately 225 km (140 mi) to the south of the Toiyabe Mountains subpopulation (USGS 2005). To date, *Bd* has not been detected in Toiyabe subpopulations (Hanson and Glenn 2011).

Another population of bullfrog co-occurs with Columbia spotted frog in the Maggie Creek basin; however, the Columbia spotted frog population has been recently tested and was found to be *Bd* negative (Hanson and Glenn 2011). Chytrid has not been associated with large die-offs of Columbia spotted frogs, which have plagued other amphibian species (Rachowicz *et al*. 2006, Adams *et* a*l*. 2010). Some evidence suggests that Columbia spotted frogs produce antimicrobial peptides in their skin that may inhibit chytrid infection (Rollins-Smith *et al*. 2002, Rollins-Smith *et al*. 2005); however, further understanding of how chytrid affects Columbia spotted frogs may be needed (Russell *et al*. 2010).

Iridoviruses of the genus *Ranavirus* were first recognized in amphibians in the 1960s and have contributed to mass mortality events worldwide (Gray *et al*. 2009). Between 1996 and 2005 within the United States, the majority of amphibian mortality events reported have been linked to ranaviruses (Green *et al*. 2002, Muths *et al*. 2006). Clinical signs of ranavirus infection and diagnosis are described by Miller *et al*. (2011) and may include erratic swimming, buoyancy problems, lethargy, swelling, redness on legs and ventrum, and red blotching on internal organs. Two mass mortality events of Columbia spotted frogs in northern Idaho (Northern DPS) were attributed to *Ranavirus* in 2009 (Russell *et al*. 2011). Another Columbia spotted frog mortality event in 2002 within Yellowstone National Park (Northern DPS) was attributed to chytrid and *Ranavirus*, with *Ranavirus* being the ultimate cause of death (Patla and Peterson 2004). *Ranavirus* has not been detected in Columbia spotted frogs within Nevada.

The potential exists for biological survey and monitoring crews working with any aquatic species, or on other related activities including habitat enhancement and research, to transmit chytrid or other pathogens between frog populations if appropriate protocols are not used to clean field equipment and outerwear.

<u>Predation - Fishes:</u> It is generally concluded that non-native salmonid and centrarchid fishes in aquatic systems can preclude the presence of native frogs or significantly decrease reproductive success by feeding on young frogs and frog eggs (Pilliod and Peterson 1997, Knapp and Matthews 2000a and 2000b, Murphy *et al*. 2010), particularly where habitats have been altered or introduced fish species have become established. The existence of non-native fish species within the historical range of Columbia spotted frogs further fragments populations, making it difficult for frogs to recolonize habitat or exchange genetic material. Where they coexist, non-native salmonids may pose a significant threat to the continued existence of Columbia spotted frogs.

Predation - Bullfrogs: Non-native bullfrogs are widely distributed in aquatic habitats throughout the Great Basin. Bullfrogs are known to compete with and prey on other frog species, and they are important vectors for spreading many types of diseases and parasites to healthy populations of native amphibians (Moyle 1973, Pearl *et al*. 2004, Casper and Hendricks 2005, Johnson and Lunde 2005, Monello *et al*. 2006, Tait 2007). Bullfrogs rarely co-occur with Columbia spotted frogs, but whether this is an artifact of competitive exclusion or predation is unknown at this time. Within Nevada, bullfrogs are known to occur in watersheds that also have Columbia spotted frogs (BLM 2011, NDOW 2012 unpublished data). In the Owyhee River Basin, bullfrogs co-occur with Columbia spotted frog in a small pond adjacent to the Owyhee River along State Route 225. Two other populations of bullfrog co-occur with Columbia spotted frog in the Humboldt River Basin in Rock Creek and Maggie Creek.

Predation - Snakes: According to Reaser (1997), the wandering terrestrial garter snake (*Thamnophis elegans vagrans*) is the most probable source of predation on spotted frogs in the Toiyabe Range. Predation from garter snakes is likely widespread throughout Nevada and is not likely to lead to the decline of the species. Mortality can occur directly through consumption or indirectly through injury to the frogs by the snakes (Jennings *et al.* 1992, NDOW 2012b).

Factor 4. Inadequate Regulatory Mechanisms: A review of the existing laws and regulations has determined that regulatory mechanisms are adequate to protect Columbia spotted frogs in combination with the actions identified in the CAS.

Columbia spotted frogs are classified as a protected amphibian by the state of Nevada under Nevada Administrative Code (NAC) 503.075(2)(a). Per NAC 503.090(1), there is no open season on those species of amphibian classified as protected. Per NAC 503.093 a person shall not hunt or take any wildlife that is classified as protected, or possess any part thereof, without first obtaining the appropriate license, permit, or written authorization from NDOW.

Classification as a Candidate Species under the ESA mandates an enhanced level of review and consultation relative to actions by federal agencies. Under USFS policy (Forest Service Manual 2620 and 2670; Manual Section 6840.06B), projects must not result in contributing to a trend toward federal listing of species. Consistent with existing laws, the BLM shall implement management plans that conserve candidate species and their habitats and shall ensure that actions authorized, funded, or carried out by the BLM do not contribute to the need for the species to become listed.

Factor 5. Other Factors: Other natural or manmade factors affecting the species' continued existence.

Climate: Ecological consequences of climate change to amphibians may include changes in population dynamics, timing of reproduction, changing geographic range, and broader community and ecosystem level changes (Hansen *et al*. 2001, McCarty 2001, Carey and Alexander 2003, Inkley *et al*. 2004, Corn 2005, Parmesan 2006, Rahel and Olden 2008, Lawler *et al*. 2010).

In contrast, McCaffery and Maxell (2010) found that decreasing winter severity associated with warmer, drier winters increased the population viability of Columbia spotted frogs in a high elevation wilderness area in Montana (Northern DPS).

The climate change related impacts to Columbia spotted frogs within Nevada are not known with certainty. Predicted outcomes of climate change imply that negative impacts will occur through increased stream temperatures, decreased stream flow, changes in the hydrograph, and increased frequency of extreme events (Stewart *et al*. 2005, Ficke *et al*. 2007, Bates *et al*. 2008, Webb *et al*. 2008, Kaushal *et al*. 2010). Water temperatures have increased and are predicted to continue to increase in the future; however, impacts from rising water temperature are not known for Columbia spotted frogs. Rising stream temperatures may allow non-native species to expand their current ranges into Columbia spotted frog occupied habitat (Rahel *et al*. 2008). Reductions in streamflow are predicted to have a negative impact on Columbia spotted frog populations because of the fragmented nature of populations, the small size of most populations, and the close association of recruitment and survival to the amount of water available. Degraded aquatic systems exhibit greatly reduced resiliency to accommodate natural disturbances such as floods, fire, and drought, thereby exacerbating the effects of those events, which may further reduce the persistence of these populations (Wilcox *et al*. 2006).

The Nevada Natural Heritage Program, in association with the Nevada Wildlife Action Plan (WAP) revision (Wildlife Action Plan Team 2012), conducted a climate change vulnerability assessment of all WAP Species of Conservation Priority (SOCP), including the Columbia spotted frog. NatureServe's Climate Change Vulnerability Index (CCVI) was used to conduct the relative vulnerability to climate change of more than 358 species (Wildlife Action Plan Team 2012, Szabo 2012). The CCVI uses a scoring system that integrates a species' predicted exposure (direct and indirect) to climate change within the assessment area (*i.e.*, the state of Nevada) and a series of factors, all supported by published studies, associated with a species' sensitivity to changes in climate. The tool also incorporates documented or modeled response to climate change, if available. The tool weighs each sensitivity score depending on the magnitude of projected climate change, incorporates any documented or modeled responses, and calculates a final vulnerability index score. Scores include vulnerable (extremely, highly, or moderately), presumed stable, or increase likely. The Columbia spotted frog scored highly vulnerable. Factors contributing to the Columbia spotted frog's vulnerability include the presence of both natural and anthropogenic barriers, the potential for altered disturbance regimes (both fire and flood), the species' dependence on ice/snow habitat during a portion of its lifecycle (Columbia spotted frogs are known to use ice-covered habitat as overwinter hibernacula), and its obvious dependence on aquatic habitat, which may be threatened with climate change (Wildlife Action Plan Team 2012, Szabo 2012).

Several dry years may cause a reduction in the number of suitable sites available to Columbia spotted frogs and affect the connectivity of extant sites. Local extirpation from habitats that in normal years are available as frog habitat may eliminate source populations for recolonization. Dry years are likely to exacerbate the effects of other threats, increasing the possibility of

stochastic extinction of subpopulations by reducing their size and their connectedness to other subpopulations (IDFG *et al.* 1995).

Drought: Drought has been an important natural disturbance in the western United States since the early Holocene (Cook *et al*. 2004, Mensing *et al*. 2008). Cook *et al*. (2004) reported that the percentage of the western United States in drought conditions has gradually increased over the last century and that the current drought rivals the drought conditions in the 1930s; however, these more recent droughts (*i.e.*, in the last century) pale in comparison to conditions found 700–1,100 years before present in terms of duration and severity. These historic drought conditions likely negatively impacted Columbia spotted frog populations throughout their range. Due to dispersal abilities, metapopulation dynamics, and unimpaired connected habitat in which they evolved, Columbia spotted frogs were able to persist and repopulate areas when conditions became favorable, despite these severe recurring drought conditions (Lake 2003; Wilcox *et al*. 2006). In 1962, Turner (1962) documented a reoccurring drought; the previous 4–6 years had caused many of the streams to dry and found locating Columbia spotted frogs difficult. In a rangewide study of long-term trends of Columbia spotted frogs, drought had a strong negative effect on population growth, most notably at sites smaller than 0.15 ha (Hossack *et al*. 2013). Summer drought conditions are predicted to intensify through the end of the century, which may negatively impact Columbia spotted frogs, particularly occupied sites that are small (Hossack *et al*. 2013, NCADAC 2013). Since most populations are now fragmented and isolated, recolonization after extirpation, or input of genetic material from other populations, may not occur naturally. With more frequent and severe droughts likely accompanying climate change, we conclude that drought is a threat to Columbia spotted frogs throughout Nevada.

Fire: Direct mortality of amphibians due to fire is thought to be rare and of minor importance to most populations (Russell *et al*. 1999, Smith 2000, Pilliod *et al*. 2003, Hossack and Corn 2007); however, few studies have documented fire effects to aquatic amphibians in the western United States (Bury 2004, Hossack and Pilliod 2011, Hossack *et al*. 2013). Most negative effects to aquatic species after wildfire are due to the immediate loss or alteration of habitat and indirect effects such as post-fire hydrologic events (Gresswell 1999, Benda *et al*. 2003, Miller *et al*. 2003, Wondzell and King 2003, Dunham *et al*. 2007, Hossack and Pilliod 2011). In addition, fire suppression activities, including construction of fire lines, back burning, application of water from pumps or aerial drops, and use of fire retardants and suppressant foams, could negatively affect amphibians (Little and Calfee 2002, Backer *et al*. 2004).

Although Columbia spotted frogs evolved in a fire-prone environment, increases in wildfire frequency and severity due to increased fuel loads, exotic species, and effects from climate change (Westerling *et al*. 2006) have increased the threats due to wildfire. Current wildfires are a larger threat to Columbia spotted frogs because of existing habitat loss and the current fragmented and isolated state of occupied habitat. While there is no information documenting negative impacts of wildfires to Columbia spotted frog populations in Nevada, we attribute this to no known studies of populations which have been impacted by recent fires. Impacts from recent fires on Columbia spotted frog populations should be investigated further.

Toxins: Toxic chemicals released into the environment from activities such as mining, agriculture, mosquito abatement, and herbicide or pesticide application can have lethal and sub-lethal effects on amphibians (Bishop 1991, Hall and Henry 1992, Davidson *et al.* 2001). Until data have been reported on the relationship between agricultural toxins/grasshopper (*Melanoplus* sp.) /Mormon cricket (*Anabrus simplex*) abatement and amphibians in Nevada, it remains a potential threat.

Amphibians are sensitive to chemical contaminants due to their habitat requirements (terrestrial and aquatic), complex life history, and their unique anatomy and physiology (Burkhart *et al*. 2003). Chemicals are the third most implicated factor in amphibian declines in the United States (Bradford 2005). Evidence of direct mortality of amphibians is relatively sparse due to the low concentrations of individual chemicals in the environment; however, sub-lethal impacts, such as decreased growth, reduced fitness, or increased susceptibility to predation, may lead to population declines (Bridges and Semlitsch 2005). Additionally, complex mixtures of various chemicals have been shown to be more toxic than individual chemicals acting alone (Burkhart *et al*. 2003, Relyea 2009).

Use of pesticides for control of grasshoppers (*Melanoplus* sp.) and crickets (*Anabrus simplex*), as well as use of herbicides to treat weeds and other vegetation, may be impacting some populations of Columbia spotted frogs, particularly on private property where monitoring does not routinely occur. Grasshopper and cricket control programs on federal lands require buffers around aquatic habitat to minimize or eliminate any impacts to aquatic organisms (U.S. Department of Agriculture 2013a). While we have no evidence to suggest Columbia spotted frogs have been directly affected in the past, we do know pesticides (*e.g.*, carbaryl), herbicides (*e.g.*, Tordon®), and other chemicals are being used in proximity to occupied sites in Oregon, Nevada, and Idaho (Pearl *et al*. 2010, U.S. Department of Agriculture 2013a, 2013b, 2013c, 2013d). There is insufficient information to conclude that pesticides are currently a threat; however, due to the application of chemicals known to cause negative impacts to amphibians being applied near occupied habitat, this potential threat should be investigated further.

Multiple Stressors: Many of the threats discussed above do not act alone. Multiple stressors can alter the effects of other stressors or act synergistically to affect individuals and populations (IPCC 2002, Boone *et al*. 2003, Westerman *et al*. 2003, Opdam and Wascher 2004, Boone *et al.* 2007, Vredenburg and Wake 2007, Lawler *et al*. 2010, Miller *et al*. 2011). For example, Kiesecker and Blaustein (1995) describe how UV-B acts with a pathogen to increase embryonic mortality above levels shown with either factor alone. Interactions between current land uses and changing climate conditions are expected to cause shifts in populations, communities, and ecosystems (Hansen *et al*. 2001), which may make certain species more vulnerable to extinction (IPCC 2002). Additionally, chemicals may exist in the environment at sub-lethal levels; however, UV light may increase the toxicity of these chemicals or may increase an individual's susceptibility to infection, disease, or predation (Boone *et al*. 2003, Burkhart *et al*. 2003, Bancroft *et al*. 2008, Rohr *et al*. 2008, Relyea 2009, Miller *et al*. 2011).

Native Trout Conservation Actions: Two conservation actions for native trout have the potential to adversely affect Columbia spotted frogs: 1) chemical control of non-native fish species; and 2) habitat/population monitoring which could result in the transmission of diseases and pathogens by field crews.

1. The use of piscicides such as rotenone or antimycin for chemical control of non-native fish species in native salmonid habitats could negatively affect Columbia spotted frog populations as described in the Toxins section above, depending on the timing of treatments and the specific chemicals used. The effects on Columbia spotted frogs as a result of toxic piscicides used in non-native trout stream treatments require further study. Gill-breathing tadpoles are most likely to be negatively affected (*e.g.*, killed outright), but the effects of rotenone on frogs and other wet-skinned, cutaneous breathing amphibians need further study and should be regarded as a potential threat to Columbia spotted frog populations (Chandler 1982, Fontenot *et al*. 1994, McCoid and Bettoli 1996). A recent laboratory study involving the effects of rotenone on Columbia spotted frog tadpoles showed that mortality increased with increasing concentrations of rotenone and longer duration of exposure (Billman *et al*. 2011). The study also showed that mortality decreased with increasing age of tadpoles, indicating either a greater ability to metabolize rotenone or a switch to lung breathing at later tadpole stages (Billman *et al*. 2011). During two separate native fish restoration projects using rotenone, Billman *et al*. (2012) documented complete Columbia spotted frog tadpole mortality despite the advanced tadpole stages; however, no juvenile or adult mortality was observed. Moreover, tadpole population estimates the following year either rebounded to previous levels or increased to levels greater than pre-treatment levels (Billman *et al*. 2012). Although the use of piscicides within occupied frog habitats could be a significant threat to specific populations without adequate mitigation, it is not a widespread or frequent activity within Nevada Columbia spotted frog habitats.

2. The movement of field crews from one location to another could potentially transmit diseases and pathogens to uninfected frog populations, as described above under the Diseases section, if appropriate disease transmission protocols are not implemented and followed.

ADAPTIVE MANAGEMENT

This Strategy depends upon the successful implementation of adaptive management and its principles. Adaptive management is designed to bring new information immediately into new management direction. All cooperators agree and recognize, consistent with the goals of this Strategy, that monitoring actions and conservation measures implemented through the CAS will be conducted experimentally consistent with the concepts of adaptive management. The effectiveness of all conservation measures and monitoring methods will be periodically reviewed and evaluated by the CSFTT. Based on such evaluation, appropriate modifications to strategies and actions will be made to ensure scientific rigor and the efficacy of conservation measures. It is critical that the signatories provide the resources necessary to ensure successful implementation of adaptive management and its principles (Figure 8).

The essential steps of the CAS adaptive management strategy are summarized as follows:

Step 1.	Implement CAS conservation objectives, goals, and strategies.
Step 2.	Initiate distribution and threat inventories and habitat monitoring program.
Step 3.	Review CAS conservation goals, objectives, and strategies and adjust as necessary based on updated information.
Step 4 (a).	Prioritize locations for implementation of conservation actions *and/or*
Step 4 (b).	Identify and prioritize research needs.
Step 5 (a).	Initiate site-specific actions to reduce or eliminate threats *and/or*
Step 5 (b).	Complete identified research projects.
Step 6.	Establish monitoring plan to determine effectiveness of conservation actions.
Step 7.	Analyze and evaluate monitoring and research results to determine progress toward attainment of conservation objectives.
Step 8.	Return to Step 3.

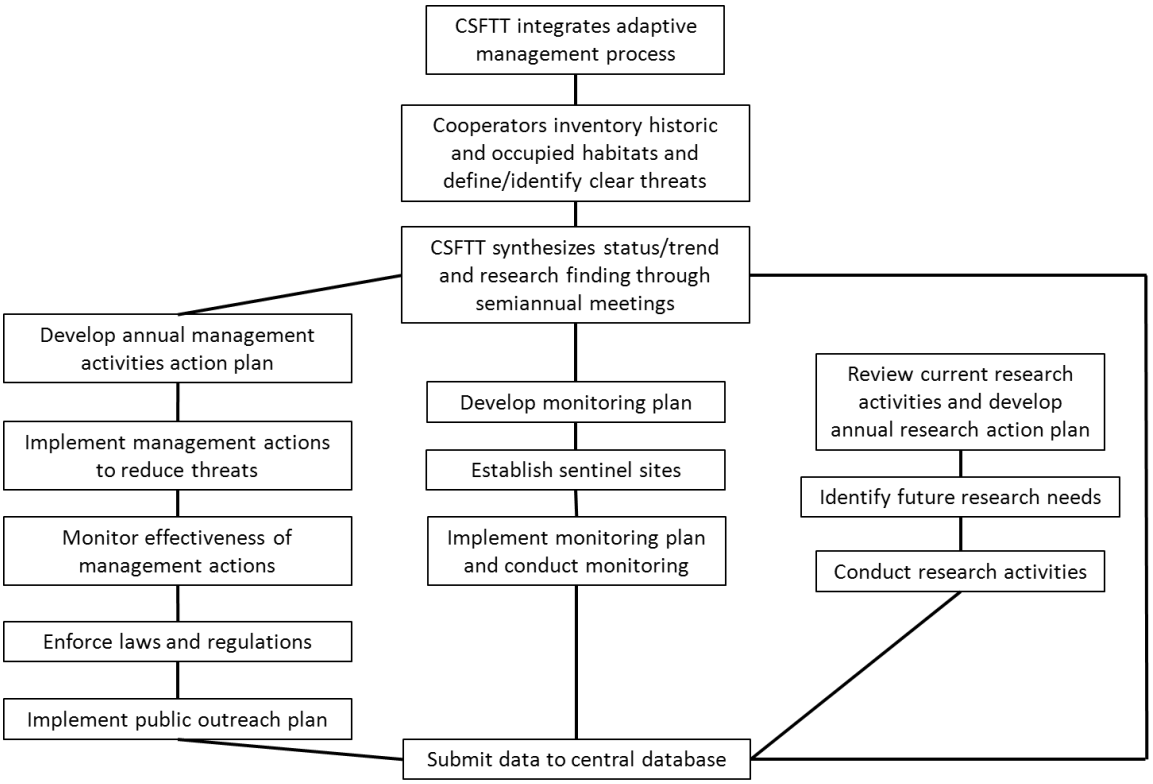

Figure 8. Adaptive management flow chart.

CONSERVATION GOALS, OBJECTIVES, STRATEGIES, AND ACTIONS

Conservation Goals

1. To reduce threats to Columbia spotted frogs and their habitat to the extent necessary to prevent population units from becoming extirpated throughout all or a portion of their historic range.
2. To maintain, enhance, and restore a sufficient number of population units of Columbia spotted frogs and the habitat to support them throughout their historic range to ensure their continued existence.

Conservation Objectives, Strategies, and Actions

The following conservation objectives, strategies, and actions must be implemented to achieve the conservation goals for the Columbia spotted frog. Conservation objectives, strategies, and actions are listed in a step-down format in which the objectives are stepped down to strategies and strategies are stepped down to specific actions.

OBJECTIVE 1. DETERMINE THE OVERALL DISTRIBUTION OF COLUMBIA SPOTTED FROGS

Strategy 1. Implement a standard protocol for inventory of Columbia spotted frogs.

Action 1. Update and revise standardized protocol as needed.

Strategy 2. Determine the distribution of Columbia spotted frogs on federal land.

Action 1. Assess the presence or absence of Columbia spotted frogs in all known historic watersheds and associated sites.

Action 2. Identify potential sites and assess the presence or absence of Columbia spotted frogs at suitable sites.

Action 3. Maintain a detailed map of historic and potential sites using GPS and GIS.

Strategy 3. Determine the distribution of Columbia spotted frogs on non-federal land.

Action 1. Identify known and potential Columbia spotted frog sites from existing information.

Action 2. Secure permission from willing non-federal landowners or controlling authorities to access property and assess the presence or absence of Columbia spotted frogs at all accessible sites.

Action 3. Maintain a detailed map of these sites using GPS and GIS.

OBJECTIVE 2. ASSESS THE TREND OF COLUMBIA SPOTTED FROG POPULATIONS, HABITAT CONDITIONS, AND EXISTING AND POTENTIAL THREATS

Strategy 1. Monitor established sites to assess population trend of Columbia spotted frogs.

Action 1. Monitor sentinel sites for egg masses.

Action 2. Monitor adult populations at sentinel sites to establish long-term population trend.

Action 3. Follow the long-term monitoring plans and revise as needed.

Strategy 2. Assess and evaluate habitat conditions at occupied sites.

Action 1. Evaluate habitat conditions at each long-term monitoring site on a periodic basis.

Action 2. Incorporate standardized habitat monitoring protocols into monitoring activities.

Action 3. Identify the range of habitat conditions that are optimum for Columbia spotted frog persistence.

Strategy 3. Identify and assess the existing and potential threats at each long-term monitoring site.

Action 1. Identify the threats at each occupied site on a periodic basis.

Action 2. Assess the degree and immanency of each threat for each site.

Strategy 4. Maintain a database for all data collected.

Action 1. Analyze data in the database to assess trend.

Strategy 5. Prevent the spread of frog diseases and pathogens.

Action 1. Use the established protocol for aquatic field crews to prevent the spread of frog diseases and pathogens among populations of Columbia spotted frogs and other aquatic species inventory and monitoring activities.

Action 2. Incorporate disease and pathogen protocols into research and collection permits issued under state and federal agency authorities.

OBJECTIVE 3. ENSURE THAT VIABLE POPULATIONS AND THEIR HABITATS ARE MANAGED AND/OR ENHANCED TO ENSURE THE CONTINUED EXISTENCE OF COLUMBIA SPOTTED FROGS THROUGHOUT THEIR HISTORIC RANGE.

Strategy 1. Delineate and verify conservation units.

Action 1. Collect genetic samples from areas prioritized by the CSFTT.

Action 2. Analyze genetics to delineate conservation units.

Action 3. Manage Columbia spotted frog populations according to conservation units.

Action 4. Evaluate the significance of Columbia spotted frog sites and habitat to the conservation of Columbia spotted frogs.

Strategy 2. Identify, prioritize, and implement site-specific actions to reduce the existing and potential threats to Columbia spotted frogs.

Action 1. Prioritize conservation units for conservation actions.

Action 2. Develop Columbia Spotted Frog Species Management Plans.

Action 3. Manage, restore, and/or enhance existing riparian and spring ecosystems to benefit all life stages of Columbia spotted frogs.

Action 4. Identify, restore and/or enhance, and manage areas of historic and potential Columbia spotted frog habitat within the presumed historic range of the species to benefit all life stages of Columbia spotted frogs.

Action 5. Identify and manage dispersal corridors, including terrestrial upland habitats, important to Columbia spotted frogs to maximize ecological connectivity among occupied/restored Columbia spotted frog habitats.

Action 6. Identify locations for beaver augmentation to benefit Columbia spotted frog conservation.

Strategy 3. Encourage non-federal landowners to conserve viable populations of Columbia spotted frogs and their habitat.

Action 1. Identify potential locations and cooperators for conservation efforts on non-federal lands.

Action 2. Provide technical assistance to willing landowners to develop Candidate Conservation Agreements with Assurances.

Action 3. Provide technical assistance to willing landowners to implement conservation action on private lands.

Action 4. Work with landowners to identify and use available public and private (non-governmental organizations) incentive programs, including Partners for Fish and Wildlife and the Wetlands Reserve Program, to protect and restore Columbia spotted frog habitat.

OBJECTIVE 4. CONDUCT RESEARCH THAT DIRECTLY SUPPORTS CONSERVATION AND MANAGEMENT OF COLUMBIA SPOTTED FROGS AND THEIR HABITAT.

Strategy 1. Identify and recommend projects to address known research needs and incorporate data into the Strategy through the adaptive management process.

Action 1. Incorporate identified research needs into CSFTT annual action plan commitments.

Action 2. Utilize research findings in annual program assessments and adaptive management reviews of the Strategy.

Strategy 2. Implement and maintain a process for identifying future research needs and incorporating research projects into the Strategy.

Action 1. Assess research needs on an ongoing basis.

Action 2. Develop and maintain a prioritized list of research needs.

Action 3. Propose research to analyze and alleviate potential threats to Columbia spotted frog habitat.

Action 4. Incorporate research needs into the Strategy by identifying lead entity(ies), budget, and time schedule.

Action 5. Implement proposed research actions as approved by the CSFTT.

Action 6. Incorporate data findings into the Strategy through the adaptive management process to ensure that goals and objectives are ultimately met.

OBJECTIVE 5. IMPLEMENT THE CAS THROUGH ADMINISTRATIVE PROCEDURES AND INCORPORATE PROVISIONS OF THE CAS INTO AGENCY PLANNING DOCUMENTS AND BUDGETS TO ENSURE THE CONSERVATION GOALS AND OBJECTIVES ARE MET IN A CONSISTENT MANNER.

Strategy 1. Enforce and administer existing policies, laws, and regulations.

Action 1. Review existing policies, laws, and regulations at least biennially and assess their adequacy to protect Columbia spotted frogs and their habitat.

Action 2. Maintain the Columbia spotted frog on protected or sensitive species lists of cooperator agencies.

Action 3. Conduct Section 7 consultation under the ESA for Columbia spotted frog projects that may affect federally listed species.

Action 4. Periodically evaluate species status under Section 4 of the ESA.

Action 5. Identify and implement non-site specific actions, policies, and procedures to reduce the existing and potential threats to Columbia spotted frogs as identified in Objective 2.

Strategy 2. Review forest, land, and resource management plans for conformance with Columbia spotted frog conservation goals, objectives, strategies, and actions.

Action 1. Consider and incorporate CAS conservation goals, objectives, strategies, and actions that would require an amendment to the Humboldt/Toiyabe Land and Resource Management Plan.

Action 2. Consider and incorporate amendments to BLM management plan documents as appropriate and necessary to implement any of the CAS conservation goals, objectives, strategies, and actions.

Action 3. Maximize retention of federal lands containing Columbia spotted frog or potential Columbia spotted frog habitat.

Strategy 3. Incorporate goals, objectives, strategies, and actions of the CAS into agency budget requests, and based on funding, revise the Strategy as necessary to update the implementation schedule.

Action 1. Conduct annual workload analysis to determine the budgetary and biological staffing needs to accomplish conservation actions identified in the implementation schedule.

Action 2. Provide managers with annual conservation action proposals for funding consistent with agency planning and budget processes.

Action 3. Pursue alternative funding strategies and partnerships to supplement agency work programs as opportunities are identified and available.

Strategy 4. Ensure implementation of the CAS through the CSFTT partnership process.

Action 1. Implement team responsibilities as defined in the CAS implementation strategy.

OBJECTIVE 6. DEVELOP AND IMPLEMENT AN INTERAGENCY ADAPTIVE MANAGEMENT FRAMEWORK PARTNERSHIP.

Strategy 1. Develop an interagency framework and process that ensures adaptive management is incorporated into the implementation of the Strategy.

Action 1. Review Strategy progress and implement any changes through an adaptive management process as needed.

Action 2. Monitor the effectiveness of each action on a set schedule to determine if the expected results are being attained within the given time frame.

Action 3. If actions are not effective, modify the strategy to implement alternative measures to ensure that goals and objectives are ultimately met.

Action 4. Ensure that data from inventory, monitoring, and research efforts are incorporated into the Strategy through the adaptive management framework.

Action 5. Modify and/or update the implementation schedule annually.

Action 6. Develop an annual action plan of site-specific management commitments by cooperator, keyed to objectives of the Strategy and Species Management Plan, research findings, and adaptive management review.

OBJECTIVE 7. SUPPORT THE CAS BY INCREASING PUBLIC AWARENESS AND APPRECIATION FOR COLUMBIA SPOTTED FROGS AND THEIR HABITAT, AND BY MAKING DATA AND INFORMATION AVAILABLE TO INTERESTED PARTIES AND DECISION MAKERS.

Strategy 1. Encourage citizen and landowner participation in CAS implementation.

Action 1. Develop brochures and other materials on the Columbia spotted frog and its management needs for dissemination to the public for educational purposes.

Action 2. Distribute informational materials as developed to the general public, recreational users, private landowners, and other stakeholders who may be involved in actions affecting Columbia spotted frogs and their habitat.

Action 3. Develop educational and informational materials on Columbia spotted frogs and their habitat/management needs for distribution through other media sources, including newspapers and television.

Action 4. Develop a program to encourage volunteer public and private land conservation efforts.

Strategy 2. Develop a process for collecting and maintaining data and information for distribution to stakeholders and decision makers.

Action 1. Maintain a repository for storage of data from inventory, monitoring, and research efforts.

Action 2. Ensure data and information developed through actions of this Strategy are available to and shared among cooperators.

Table S-1. Conservation Strategy Implementation Schedule			
Objectives, Strategies, and Actions	**Action Status**		**Responsible Parties**
	Initiation	**Expected Completion Date**	
Objective 1. DETERMINE THE OVERALL DISTRIBUTION OF COLUMBIA SPOTTED FROGS			
Strategy 1. Implement a standard protocol for inventory of Columbia spotted frogs.			
Action 1. Update and revise standardized protocol as needed.	2004	Ongoing	ALL
Strategy 2. Determine the distribution of Columbia spotted frogs on federal land.			
Action 1. Assess the presence or absence of Columbia spotted frogs at all known historic watersheds and associated sites.	2004	2024	NDOW, USFS, BLM
Action 2. Identify potential sites and assess the presence or absence of Columbia spotted frogs at suitable sites.	2004	Ongoing	NDOW, USFS, BLM
Action 3. Maintain a detailed map of historic and potential sites using GPS and GIS.	2004	Ongoing	NNHP
Strategy 3. Determine the distribution of Columbia spotted frogs on non-federal land.			
Action 1. Identify known and potential Columbia spotted frog sites from existing information.	2004	Ongoing	NDOW, USFS, BLM
Action 2. Secure permission from willing non-federal landowners or controlling authorities to access property and assess the presence or absence of Columbia spotted frogs at all accessible sites.	2004	Ongoing	NDOW, USFS, BLM
Action 3. Maintain a detailed map of these sites using GPS and GIS.	2004	Ongoing	NNHP
Objective 2. ASSESS THE TREND OF COLUMBIA SPOTTED FROG POPULATIONS, HABITAT CONDITIONS, AND EXISTING AND POTENTIAL THREATS			
Strategy 1. Monitor established sites to assess population trend of Columbia spotted frogs.			
Action 1. Monitor sentinel sites for egg masses.	2004	Ongoing	NDOW, USFS, BLM
Action 2. Monitor adult populations at sentinel sites to establish long-term population trend.	2004	Ongoing	ALL
Action 3. Follow the long-term monitoring plans and revise as needed.	2004	Ongoing	ALL
Strategy 2. Assess and evaluate habitat conditions at occupied sites.			
Action 1. Evaluate habitat conditions at each long-term monitoring site on a periodic basis.	2004	Ongoing	NDOW, USFS, BLM
Action 2. Incorporate standardized habitat monitoring protocols into monitoring activities.	2004	Ongoing	ALL
Action 3. Identify the range of habitat conditions that are optimum for Columbia spotted frog persistence.	2004	Ongoing	ALL
Strategy 3. Identify and assess the existing and potential threats at each long-term monitoring site.			
Action 1. Identify the threats at each occupied site on a periodic basis.	2004	Ongoing	ALL
Action 2. Assess the degree and immanency of each threat for each site.	2004	Ongoing	ALL
Strategy 4. Maintain a database for all data collected.			
Action 1. Analyze data in the database to assess trend.	2005	Ongoing	ALL
Strategy 5. Prevent the spread of frog diseases and pathogens.			

Action 1. Use the established protocol for aquatic field crews to prevent the spread of frog diseases and pathogens among populations of Columbia spotted frogs and other aquatic species inventory and monitoring activities.		X	ALL
Action 2. Require aquatic field crews to implement adopted protocol.		Ongoing	ALL
Action 3. Incorporate disease and pathogen protocols into research and collection permits.		Ongoing	NDOW
Objective 3. ENSURE THAT VIABLE POPULATIONS AND THEIR HABITATS ARE MANAGED AND/OR ENHANCED TO ENSURE THE CONTINUED EXISTENCE OF COLUMBIA SPOTTED FROGS THROUGHOUT THEIR HISTORIC RANGE.			
Strategy 1. Delineate and verify conservation units			
Action 1. Collect genetic samples from areas prioritized by the team	X	Ongoing	NDOW
Action 2. Analyze genetics to delineate conservation units		2024	TBA
Action 3. Manage Columbia spotted frog populations according to conservation units		2024	ALL
Action 4. Evaluate the significance of Columbia spotted frog sites and habitat to the conservation of Columbia spotted frogs.		2024	ALL
Strategy 2. Identify and implement site-specific actions to reduce the existing and potential threats to Columbia spotted frogs			
Action 1. Prioritize conservation units for conservation actions.	2004	Ongoing	ALL
Action 2. Develop Columbia spotted frog Species Management Plans		2015	NDOW
Action 3. Manage, restore, and/or enhance existing riparian and spring ecosystems to benefit all life stages of Columbia spotted frogs.	2004	Ongoing	USFS, BLM
Action 4. Identify, restore and/or enhance, and manage areas of historic unoccupied and potential Columbia spotted frog habitat within the presumed historic range of the species to benefit all life stages of Columbia spotted frogs.			ALL
Action 5. Identify and manage dispersal corridors, including terrestrial upland habitats, important to Columbia spotted frogs to maximize ecological connectivity among occupied/restored Columbia spotted frog habitats.	2004	Ongoing	ALL
Action 6. Identify locations for beaver augmentation to benefit Columbia spotted frog conservation.		Ongoing	ALL
Strategy 3. Encourage non-federal landowners to conserve viable populations of Columbia spotted frogs and their habitat.			
Action 1. Identify potential locations and cooperators for conservation efforts on non-federal lands.		Ongoing	ALL
Action 2. Provide technical assistance to willing landowners to develop Candidate Conservation Agreements with Assurances		Ongoing	USFWS
Action 3. Provide technical assistance to willing landowners to implement conservation action on private lands.		Ongoing	USFWS
Action 4. Work with landowners to identify and use available public and private (NGO) incentive programs to protect and restore Columbia spotted frog habitat.		Ongoing	USFWS, NDOW
Objective 4. CONDUCT RESEARCH THAT DIRECTLY SUPPORTS CONSERVATION AND MANAGEMENT OF COLUMBIA SPOTTED FROGS AND THEIR HABITAT.			
Strategy 1. Identify and recommend projects to address known research needs and incorporate data into the Conservation Strategy through the adaptive management process.			
Action 1. Incorporate identified research needs into CSFTT annual action plan commitments.	2004	Ongoing	ALL
Action 2. Utilize research findings in annual program assessments and adaptive management reviews of the Strategy.	2004	Ongoing	ALL
Strategy 2. Implement and maintain a process for identifying future research needs and incorporating research projects into the Strategy.			
Action 1. Assess research needs on an ongoing basis.	2004	Ongoing	ALL
Action 2. Develop and maintain a prioritized list of research needs.	2004	Ongoing	ALL

Action 3. Purpose research to analyze and alleviate potential threats to Columbia spotted frog habitat.	2004	Ongoing	ALL
Action 4. Incorporate research needs into the Strategy by identifying lead entity(s), budget, and time schedule.	2004	Ongoing	ALL
Action 5. Implement proposed research actions as approved by the CSFTT.	2004	Ongoing	ALL
Action 6. Incorporate data findings into the Strategy through the adaptive management process to ensure that goals and objectives are ultimately met.	2004	Ongoing	ALL
Objective 5. IMPLEMENT THE CAS THROUGH ADMINISTRATIVE PROCEDURES AND INCORPORATE PROVISIONS OF THE STRATEGY INTO AGENCY PLANNING DOCUMENTS AND BUDGETS TO ENSURE THE CONSERVATION GOALS AND OBJECTIVES ARE MET IN A CONSISTENT MANNER.			
Strategy 1. Enforce and administer existing policies, laws, and regulations.			
Action 1. Review existing policies, laws, and regulations at least biennially and assess their adequacy to protect Columbia spotted frogs and their habitat	2004	Ongoing	ALL
Action 2. Maintain the Columbia spotted frog on agency protected or sensitive species lists of cooperator agencies.		Ongoing	USFS, BLM, NDOW, NNHP
Action 3. Conduct Section 7 consultation under the ESA for Columbia spotted frog projects that may affect federally listed species.	2004	Ongoing	USFWS, USFS, BLM
Action 4. Periodically evaluate species status under Section 4 of the ESA	1993	2015	USFWS
Action 5. Identify and implement non-site specific actions, policies, and procedures to reduce the existing and potential threats to Columbia spotted frogs as identified in Objective 2.	2004	Ongoing	ALL
Strategy 2. Review forest, land, and resource management plans periodically for conformance with Columbia spotted frog conservation goals, objectives, strategies, and actions.			
Action 1. Incorporate CAS conservation goals, objectives, strategies, and actions, as appropriate, during the Forest Land and Resource Management Plan.	2004	Ongoing	USFS
Action 2. Consider and incorporate amendments to BLM management plan documents as appropriate and necessary to implement CAS conservation goals, objectives, strategies, and actions.			BLM
Action 3. Maximize retention of federal lands containing Columbia spotted frogs or potential Columbia spotted frog habitat.	2004	Ongoing	USFS,BLM
Strategy 3. Incorporate goals, objectives, strategies, and actions of the CAS into agency budget requests, and based on funding revise the Strategy as necessary to update implementation schedule.			
Action 1. Conduct annual workload analysis to determine the budgetary and biological staffing needs to accomplish conservation actions identified in the implementation schedule.	2004	Ongoing	ALL
Action 2. Provide their respective managers with annual conservation action proposals for funding consistent with agency planning and budget processes.	2004	Ongoing	ALL
Action 3. Pursue alternative funding strategies and partnerships to supplement agency work programs as opportunities are identified and available.	2004	Ongoing	ALL
Strategy 4. Ensure implementation of the CAS through the CSFTT partnership process.			
Action 1. Implement team responsibilities as defined in the CAS implementation strategy	2014	Ongoing	ALL
Objective 6. DEVELOP AND IMPLEMENT AN INTERAGENCY ADAPTIVE MANAGEMENT FRAMEWORK PARTNERSHIP.			
Strategy 1. Develop an interagency framework process that ensures adaptive management is incorporated into the implementation of the Strategy.			
Action 1. Review Strategy progress and implement any changes through an adaptive management process as needed..	2014	Ongoing	ALL

Action 2. Monitor the effectiveness of each action on a set schedule to determine if the expected results are being attained within the given time frame.	2014	Ongoing	ALL
Action 3. If actions are not effective, modify the strategy to implement alternative measures to ensure that goals and objectives are ultimately met.	2014	Ongoing	ALL
Action 4. Ensure that data from inventory, monitoring, and research efforts are incorporated into the Strategy through the adaptive management framework.	2014	Ongoing	ALL
Action 5. Modify and/or update the implementation schedule table yearly.	2014	Ongoing	ALL
Action 6. Develop an annual action plan of site-specific management commitments by cooperator, keyed to objectives of the Strategy and Species Management Plan, research findings, and adaptive management review.	2014	Ongoing	ALL
Objective 7. SUPPORT THE CAS BY INCREASING PUBLIC AWARENESS AND APPRECIATION FOR COLUMBIA SPOTTED FROGS AND THEIR HABITAT, AND BY MAKING DATA AND INFORMATION AVAILABLE TO INTERESTED PARTIES AND DECISION MAKERS.			
Strategy 1. Encourage citizen and landowner participation in CAS implementation.			
Action 1. Develop brochures and other materials on the Columbia spotted frog and its management needs for dissemination to the public for education purposes.			ALL
Action 2. Distribute informational materials to the general public, recreational users, private landowners, and other stakeholders who may be involved in actions affecting Columbia spotted frogs and their habitat.		Ongoing	ALL
Action 3. Develop educational and informational materials on Columbia spotted frogs and their habitat/management needs for distribution through other media sources, including newspapers and television.	2004	Ongoing	ALL
Action 4. Develop a program to encourage volunteer public and private land conservation efforts.	2004	Ongoing	ALL
Strategy 2. Develop a process for collecting and maintaining data and information and distribution to stakeholders and decision makers.			
Action 1. Maintain a repository for storage of GIS data on Columbia spotted frog distribution.	2004	Ongoing	NNHP
Action 2. Ensure data and information developed through actions of this strategy are be available to and shared among cooperators.	2004	Ongoing	ALL

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